Exhibit A

Assessing and Managing Chemicals under TSCA

CONTACT US <https://epa.gov/assessing-and-managing-chemicals-under-tsca/forms/assessing-and-managing-chemicals-under-tsca>

Regulation of Chemicals under Section 6(a) of the Toxic Substances Control Act

On this page:

§ 6 Rules Under Amended TSCA

Final Rules

- **Regulation of Persistent Bioaccumulative and Toxic Chemicals under TSCA section 6(h).** In December 2020, EPA released final rules under the Toxic Substances Control Act (TSCA) to reduce exposure to five chemicals that are persistent, bioaccumulative and toxic (PBT).
  - Read the press release <https://epa.gov/newsreleases/epa-finalizes-action-protecting-americans-pbt-chemicals>.
- **Methylene Chloride:** On March 15, 2019, EPA issued a final rule under Section 6 of TSCA to address the unreasonable risks presented by methylene chloride in paint and coating removal for consumer use.
  - Read the press release <https://epa.gov/node/219509>.
  - Read the final rule on methylene chloride in paint and coating removal for consumer use.
  - Learn more about risk management for methylene chloride <https://epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-methylene-chloride>.
  - Read the small entity compliance guide <https://epa.gov/assessing-and-managing-chemicals-under-tsca/small-entity-compliance-guidance-regulation-methylene>.

- **Amended Procedural Rule**: On December 21, 2016, EPA issued a direct final rule removing portions of outdated procedural regulations promulgated under the old version of TSCA specifying certain procedural requirements for rulemaking under section 6, including the requirement for a hearing from part 750 of the Code of Federal Regulations. The old procedures are not consistent with the timelines and requirements of TSCA, as amended by the Frank R. Lautenberg Chemical Safety for the 21st Century Act. As amended, TSCA no longer mandates an informal hearing and instead mandates certain timeframes for taking regulatory action on identified unreasonable risk after a chemical has undergone risk evaluation. This final rule also makes minor conforming changes to the procedural rules for exemptions from the prohibitions in TSCA section 6(e) applicable to PCBs.
    - Read the direct final rule.
    - Read about EPA's effort to develop regulations to implement the framework of the amended TSCA <https://epa.gov/assessing-and-managing-chemicals-under-tsca/frank-r-lautenberg-chemical-safety-21st-century-act-4#framework>.

§ 6 Rules Prior to June 2016

Some Section 6 actions have led to ongoing programs relating to chemical substances of national concern, such as asbestos <https://epa.gov/asbestos> and polychlorinated biphenyls (PCBs) <https://epa.gov/pcbs>. Others – such as acrylamide <https://www.govinfo.gov/content/pkg/fr-2002-12-02/pdf/02-30470.pdf> – were withdrawn when the circumstances that led to the proposal of the rule changed, enabling the risk to be reduced without rulemaking.

- **Polychlorinated biphenyls (PCBs): Manufacturing, Processing, Distribution in Commerce and Use Prohibitions.**
  EPA formalized the statutory ban contained in section 6(e) of TSCA in final regulations issued on May 31, 1979, 44 FR 31542. Subsequently, EPA has taken numerous actions to regulate PCB uses and disposal.
    - View the PCB regulations at 40 CFR Part 761.
    - Learn more about PCBs <https://epa.gov/pcbs>.
- **Metalworking Fluids: Specific Use Requirements for Certain Chemical Substances**
  EPA took three actions to limit certain uses of metalworking fluids:
    - Mixed mono and diamides of an organic acid at 40 CFR 747.115
    - Triethanolamine salt of a substituted organic acid at 40 CFR 747.195
    - Triethanolamine salt of tricarboxylic acid at 40 CFR 747.200
- **Water Treatment Chemicals: Air Conditioning and Cooling Systems**
    - Hexavalent chromium-based water treatment chemicals in cooling systems at 40 CFR 749.68

- **Asbestos Worker Protection**
  EPA issued asbestos worker protection rules extending the Occupational Safety and Health Administration (OSHA) Asbestos standards in 29 CFR 1910.1001 and 29 CFR 1926.1101 to certain state and local government employees.
  - View the regulations at 40 CFR Part 763, Subpart G.
  - Learn more about Asbestos <https://epa.gov/asbestos>
- **Prohibition of the Manufacture, Importation, Processing and Distribution in Commerce of Certain Asbestos-Containing Products; Labeling Requirements**
  EPA's ban on existing uses of asbestos, known as the Asbestos Ban and Phaseout Rule, was remanded in the Corrosion Proof Fittings v. EPA case (947 F.2d 1201). Learn more <https://epa.gov/asbestos/asbestos-laws-and-regulations>.
  - EPA's ban on new uses of asbestos remains in effect. Read the regulations at 40 CFR Part 763 Subpart I.

Background

Section 6 of the Toxic Substances Control Act (TSCA) <https://www.govinfo.gov/content/pkg/uscode-2012-title15/html/uscode-2012-title15-chap53-subchapi-sec2605.htm>, as amended by the Frank R. Lautenberg Chemical Safety for the 21st Century Act, provides EPA with the authority to prohibit or limit the manufacture, processing, distribution in commerce, use, or disposal of a chemical if EPA evaluates the risk and concludes that the chemical presents an unreasonable risk to human health or the environment.

Please Note

On June 22, 2016, the Frank R. Lautenberg Chemical Safety for the 21st Century Act, which updates the Toxic Substances Control Act was signed into law.

For more information on the risk evaluation and prioritization final rules <https://epa.gov/assessing-and-managing-chemicals-under-tsca/frank-r-lautenberg-chemical-safety-21st-century-act-4>.

Learn more about the new law, find summary information and read frequently asked questions. <https://epa.gov/assessing-and-managing-chemicals-under-tsca/frank-r-lautenberg-chemical-safety-21st-century-act>

The law authorizes EPA to issue regulations requiring one or more of the following actions to the extent necessary so that the chemical substance no longer presents an unreasonable risk:

- Prohibit or otherwise restrict manufacture, processing, or distribution in commerce;
- Prohibit or otherwise restrict for a particular use or above a set concentration;

- Require minimum warnings and instructions with respect to use, distribution in commerce, or disposal;
- Require recordkeeping or testing;
- Prohibit or regulate any manner or method of commercial use;
- Prohibit or regulate any manner or method of disposal; and/or
- Direct manufacturers or processors to give notice of the unreasonable risk to distributors and replace or repurchase products if required.

EPA must issue these regulations within specific timelines and in accordance with additional requirements laid out in TSCA section 6(c) (15 U.S.C. §2605).

In addition, EPA is also authorized to regulate under section 6 of TSCA:

- Chemicals defined under section 6(h) of TSCA.
  - These are certain chemicals that meet the statutory criteria for persistent, bioaccumulative, and toxic chemicals as described in section 6(h) (15 U.S.C. §2605). EPA identified five chemicals meeting these criteria. <https://epa.gov/assessing-and-managing-chemicals-under-tsca/frequent-questions-frank-r-lautenberg-chemical-safety#q18>
  - These chemicals are candidates for regulatory action, with a statutory requirement for a proposed rule no later than 3 years after June 22, 2016.

Read TSCA Section 6 (15 U.S.C. §2605).

Assessing and Managing Chemicals under TSCA Home <https://epa.gov/assessing-and-managing-chemicals-under-tsca>

How EPA Evaluates the Safety of Existing Chemicals <https://epa.gov/assessing-and-managing-chemicals-under-tsca/how-epa-evaluates-safety-existing-chemicals>

Prioritizing Existing Chemicals for Risk Evaluation <https://epa.gov/assessing-and-managing-chemicals-under-tsca/prioritizing-existing-chemicals-risk-evaluation>

Risk Evaluations for Existing Chemicals <https://epa.gov/assessing-and-managing-chemicals-under-tsca/risk-evaluations-existing-chemicals-under-tsca>

Risk Management for Existing Chemicals <https://epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-existing-chemicals-under-tsca>

Contact Us <https://epa.gov/assessing-and-managing-chemicals-under-tsca/forms/assessing-and-managing-chemicals-under-tsca> to ask a question, provide feedback, or report a problem.

Exhibit B

Learn about Polychlorinated Biphenyls (PCBs)

On this page:

What Are PCBs?

PCBs are a group of man-made organic chemicals consisting of carbon, hydrogen and chlorine atoms. The number of chlorine atoms and their location in a PCB molecule determine many of its physical and chemical properties. PCBs have no known taste or smell, and range in consistency from an oil to a waxy solid.

PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until manufacturing was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including:

- Electrical, heat transfer and hydraulic equipment
- Plasticizers in paints, plastics and rubber products
- Pigments, dyes and carbonless copy paper
- Other industrial applications

Inadvertent PCBs

In the United States, PCBs were commercially manufactured from 1929 until production was banned in 1979 by the Toxic Substances Control Act (TSCA). However, EPA's regulations implementing TSCA for PCBs allow some inadvertent generation of PCBs to occur in excluded manufacturing processes, as defined in title 40 of the Code of Federal Regulations (CFR) section 761.3.

Specifically, the PCB regulations allow inadvertently generated PCBs (iPCBs) at defined concentrations, under certain conditions, and with requirements to report to EPA and maintain certain records. Learn more about iPCBs <https://epa.gov/pcbs/inadvertent-pcbs>, including the regulatory context, EPA enforcement, iPCBs in the environment, ongoing research conducted by the EPA, and pollution prevention efforts.

Commercial Uses for PCBs

Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban. Products that may contain PCBs include:

- Transformers and capacitors
- Electrical equipment including voltage regulators, switches, re-closers, bushings, and electromagnets
- Oil used in motors and hydraulic systems
- Old electrical devices or appliances containing PCB capacitors
- Fluorescent light ballasts <https://epa.gov/pcbs/disposal-fluorescent-light-ballasts-flb>
- Cable insulation
- Thermal insulation material including fiberglass, felt, foam, and cork
- Adhesives and tapes
- Oil-based paint
- Caulking <https://epa.gov/pcbs/study-plans-related-polychlorinated-biphenyls-pcbs-schools>
- Plastics
- Carbonless copy paper
- Floor finish

The PCBs used in these products were chemical mixtures made up of a variety of individual chlorinated biphenyl components known as congeners. Most commercial PCB mixtures are known in the United States by their industrial trade names, the most common being Arochlor.

Release and Exposure of PCBs

Today, PCBs can still be released into the environment from:

- Poorly maintained hazardous waste sites that contain PCBs
- Illegal or improper dumping of PCB wastes
- Leaks or releases from electrical transformers containing PCBs
- Disposal of PCB-containing consumer products into municipal or other landfills not designed to handle hazardous waste
- Burning some wastes in municipal and industrial incinerators

PCBs do not readily break down once in the environment. They can remain for long periods cycling between air, water and soil. PCBs can be carried long distances and have been found in snow and sea water in areas far from where they were released into the environment. As a consequence, they are found all over the world. In general, the lighter the form of PCB, the further it can be transported from the source of contamination.

PCBs can accumulate in the leaves and above-ground parts of plants and food crops. They are also taken up into the bodies of small organisms and fish. As a result, people who ingest fish may be exposed to PCBs that have bioaccumulated in the fish they are ingesting.

The National Center for Health Statistics, a division of the Centers for Disease Control and Prevention, conducts the National Health and Nutrition Examination Surveys (NHANES). NHANES is a series of U.S. national surveys on the health and nutrition status of the noninstitutionalized civilian population, which includes data collection on selected chemicals. Interviews and physical examinations are conducted with approximately 10,000 people in each two-year survey cycle. PCBs are one of the chemicals where data are available from the NHANES surveys <https://epa.gov/americaschildrenenvironment/ace-biomonitoring>.

PCB Congeners

Related Information

EPA Region 3 Interim Guidelines for the Validation of Data Generated Using Method 1668 PCB Congener Data <https://epa.gov/quality/epa-region-iii-interim-guidelines-validation-data-generated-using-method-1668-pcb-congener>

A PCB congener is any single, unique well-defined chemical compound in the PCB category. The name of a congener specifies the total number of chlorine substituents, and the position of each chlorine. For example: 4,4'-Dichlorobiphenyl is a congener comprising the biphenyl structure with two chlorine substituents - one on each of the #4 carbons of the two rings. In 1980, a numbering system was developed which assigned a sequential number to each of the 209 PCB congeners.

- Table of PCB Congeners <https://epa.gov/pcbs/table-polychlorinated-biphenyl-pcb-congeners>

PCB Homologs

Homologs are subcategories of PCB congeners that have equal numbers of chlorine substituents. For example, the tetrachlorobiphenyls are all PCB congeners with exactly 4 chlorine substituents that can be in any arrangement.

- Table of PCB Homologs <https://epa.gov/pcbs/table-polychlorinated-biphenyl-pcb-homologs>

PCB Mixtures and Trade Names

With few exceptions, PCBs were manufactured as a mixture of individual PCB congeners. These mixtures were created by adding progressively more chlorine to batches of biphenyl until a certain target percentage of chlorine by weight was achieved. Commercial mixtures with higher percentages of chlorine contained higher proportions of the more heavily chlorinated congeners, but all congeners could be expected to be present at some level in all mixtures. While PCBs were manufactured and sold under many names, the most common was the Aroclor series.

- Individual PCB Congeners <https://epa.gov/pcbs/table-polychlorinated-biphenyl-pcb-congeners>

Aroclor

Aroclor is a PCB mixture produced from approximately 1930 to 1979. It is one of the most commonly known trade names for PCB mixtures. There are many types of Aroclors and each has a distinguishing suffix number that indicates the degree of chlorination. The numbering standard for the different Aroclors is as follows:

- The first two digits usually refer to the number of carbon atoms in the phenyl rings (for PCBs this is 12)
- The second two numbers indicate the percentage of chlorine by mass in the mixture. For example, the name Aroclor 1254 means that the mixture contains approximately 54% chlorine by weight.
- Table of Aroclors <https://epa.gov/pcbs/table-aroclors>

PCB Trade Names

PCBs were manufactured and sold under many different names. The names in the following table have been used to refer to PCBs or to products containing PCBs. Please note:

- Some of these names may be used for substances or mixtures not containing PCBs.
- Many of these names were used with distinguishing suffixes, indicating degree of chlorination, type of formulation, or other properties (e.g., Aroclor 1254; Clophen A60).
- Some of these names may be misspellings of the correct names, but are included here for completeness.

	PCB Trade Names	

	PCB Trade Names	
Aceclor	Diaclor	PCB
Adkarel	Dicolor	PCB's
ALC	Diconal	PCBs
Apirolio	Diphenyl, chlorinated	Pheaoclor
Apirorlio	DK	Phenochlor
Arochlor	Duconal	Phenoclor
Arochlors	Dykanol	Plastivar
Aroclor	Educarel	Polychlorinated biphenyl
Aroclors	EEC-18	Polychlorinated biphenyls
Arubren	Elaol	Polychlorinated diphenyl
Asbestol	Electrophenyl	Polychlorinated diphenyls
ASK	Elemex	Polychlorobiphenyl
Askael	Elinol	Polychlorodiphenyl
Askarel	Eucarel	Prodelec
Auxol	Fenchlor	Pydrau
Bakola	Fenclor	Pyraclor
Biphenyl, chlorinated	Fenocloro	Pyralene
Chlophen	Gilotherm	Pyranol
Chloretol	Hydol	Pyroclor
Chlorextol	Hyrol	Pyronol
Chlorinated biphenyl	Hyvol	Saf-T-Kuhl
Chlorinated diphenyl	Inclor	Saf-T-Kohl
Chlorinol	Inerteen	Santosol
Chlorobiphenyl	Inertenn	Santotherm
Chlorodiphenyl	Kanechlor	Santothern
Chlorphen	Kaneclor	Santovac
Chorextol	Kennechlor	Solvol
Chorinol	Kenneclor	Sorol
Clophen	Leromoll	Soval
Clophenharz	Magvar	Sovol

	PCB Trade Names	
Cloresil	MCS 1489	Sovtol
Clorinal	Montar	Terphenychlore
Clorphen	Nepolin	Therminal
Decachlorodiphenyl	No-Flamol	Therminol
Delor	NoFlamol	Turbinol
Delorene	Non-Flamol	
	Olex-sf-d	
	Orophene	

Health Effects of PCBs

PCBs have been demonstrated to cause a variety of adverse health effects. They have been shown to cause cancer in animals as well as a number of serious non-cancer health effects in animals, including: effects on the immune system, reproductive system, nervous system, endocrine system and other health effects. Studies in humans support evidence for potential carcinogenic and non-carcinogenic effects of PCBs. The different health effects of PCBs may be interrelated. Alterations in one system may have significant implications for the other systems of the body. The potential health effects of PCB exposure are discussed in greater detail below.

- Cancer
- Non-Cancer Effects
- Immune Effects
- Reproductive Effects
- Neurological Effects
- Endocrine Effects
- Other Non-cancer Effects
- Integrated Risk Information System (IRIS)

Cancer

Did you know?

EPA uses an approach that permits evaluation of the complete carcinogenicity database and allows the results of individual studies to be viewed in the context of all of the other available studies.

Studies in animals provide conclusive evidence that PCBs cause cancer. Studies in humans raise further concerns regarding the potential carcinogenicity of PCBs. Taken together, the data strongly suggest that PCBs are probable human carcinogens.

PCBs are one of the most widely studied environmental contaminants. Many studies in animals and human populations have been performed to assess the potential carcinogenicity of PCBs. EPA's first assessment of PCB carcinogenicity was completed in 1987. At that time, data was limited to Aroclor 1260. In 1996, at the direction of Congress, EPA completed a reassessment of PCB carcinogenicity titled "PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures". <https://epa.gov/pcbs/cancer-dose-response-assessment-polychlorinated-biphenyls-pcbs-and-application-environmental> EPA's cancer reassessment reflected the Agency's commitment to the use of the best science in evaluating health effects of PCBs. The reassessment was peer reviewed by 15 experts on PCBs, including scientists from government, academia and industry. The peer reviewers agreed with EPA's conclusion that PCBs are probable human carcinogens.

EPA uses an approach that permits evaluation of the complete carcinogenicity database, and allows the results of individual studies to be viewed in the context of all of the other available studies. Studies in animals provide conclusive evidence that PCBs cause cancer. Studies in humans raise further concerns regarding the potential carcinogenicity of PCBs. Taken together, the data strongly suggest that PCBs are probable human carcinogens.

The cancer reassessment determined that PCBs are probable human carcinogens, based on the following information:

EPA reviewed all of the available literature on the carcinogenicity of PCBs in animals as an important first step in the cancer reassessment, which presented clear evidence that PCBs causes cancer in animals. An industry scientist commented that "all significant studies have been reviewed and are fairly represented in the document". An industry-sponsored peer-reviewed rat study, characterized as the "gold standard study" by one peer reviewer, demonstrated that every commercial PCB mixture tested caused cancer. The new studies reviewed in the PCB reassessment allowed EPA to develop more accurate potency estimates than previously available for PCBs. The reassessment provided EPA with sufficient information to develop a range of potency estimates for different PCB mixtures, based on the incidence of liver cancer and in consideration of the mobility of PCBs in the environment

The reassessment resulted in a slightly decreased cancer potency estimate for Aroclor 1260 relative to the 1987 estimate due to the use of additional dose-response information for PCB mixtures and refinements in risk assessment techniques (e.g., use of a different animal-to-human scaling factor for dose). The reassessment concluded that the types of PCBs likely to be bioaccumulated in fish and bound to sediments are the most carcinogenic PCB mixtures.

In addition to the animal studies, a number of epidemiological studies of workers exposed to PCBs have been performed. Results of human studies raise concerns for the potential carcinogenicity of PCBs. Studies of PCB workers found increases in rare liver cancers and malignant melanoma. The presence of cancer in the same target organ (liver) following exposures to PCBs both in animals and in humans and the finding of liver cancers and malignant melanomas across multiple human studies adds weight to the conclusion that PCBs are probable human carcinogens.

Some of the studies in humans have not demonstrated an association between exposures to PCBs and disease. However, epidemiological studies share common methodological limitations that can affect their ability to discern important health effects (or define them as statistically significant) even when they are present. Often, the number of individuals in a study is too small for an effect to be revealed, or there are difficulties in determining actual exposure levels, or there are multiple confounding factors (factors that tend to co-occur with PCB exposure, including smoking, drinking of alcohol, and exposure to other chemicals in the workplace). Epidemiological studies may not be able to detect small increases in cancer over background unless the cancer rate following contaminant exposure is very high or the exposure produces a very unusual type of cancer. However, studies that do not demonstrate an association between exposure to PCBs and disease should not be characterized as negative studies. These studies are most appropriately viewed as inconclusive. Limited studies that produce inconclusive findings for cancer in humans do not mean that PCBs are safe.

It is very important to note that the composition of PCB mixtures changes following their release into the environment. The types of PCBs that tend to bioaccumulate in fish and other animals and bind to sediments happen to be the most carcinogenic components of PCB mixtures. As a result, people who ingest PCB-contaminated fish or other animal products and contact PCB-contaminated sediment may be exposed to PCB mixtures that are even more toxic than the PCB mixtures contacted by workers and released into the environment.

EPA's peer reviewed cancer reassessment concluded that PCBs are probable human carcinogens. EPA is not alone in its conclusions regarding PCBs. The International Agency for Research on Cancer has declared PCBs to be probably carcinogenic to humans. The National Toxicology Program has stated that it is reasonable to conclude that PCBs are carcinogenic in humans. The National Institute for Occupational Safety and Health has determined that PCBs are a potential occupational carcinogen.

Non-Cancer Effects

EPA evaluates all of the available data in determining the potential noncarcinogenic toxicity of environmental contaminants, including PCBs. Based on extensive studies conducted using environmentally relevant doses, EPA found clear evidence that PCBs have significant toxic effects in animals, including non-human primates. PCBs can affect an animal’s immune system, reproductive system, nervous system and endocrine system. The body's regulation of all of these systems is complex and interrelated. As a result, it is not surprising that PCBs can exert a multitude of serious adverse health effects.

Immune Effects

Did you know?

Epstein-Barr Virus (EBV) <http://www.cdc.gov/epstein-barr/about-ebv.html>, also known as human herpesvirus 4, is a member of the herpes virus family. It is one of the most common human viruses and is found all over the world. EBV spreads most commonly through bodily fluids, primarily saliva.

(Source: Centers for Disease Control) <http://www.cdc.gov/epstein-barr/about-ebv.html>

The immune system is critical for fighting infections, and diseases of the immune system have very serious potential implications for the health of humans and animals. The immune effects of PCB exposure have been studied in Rhesus monkeys and other animals. It is important to note that the immune systems of Rhesus monkeys and humans are very similar. Studies in monkeys and other animals have revealed a number of serious effects on the immune system following exposures to PCBs:

- Significant decrease in size of the thymus gland, which is critical to the immune system in infant monkeys
- Reductions in the response of the immune system following a challenge with sheep red blood cells. This is a standard laboratory test that determines the ability of an animal to mount a primary antibody response and develop protective immunity
- Decreased resistance to Epstein-Barr virus and other infections in PCB-exposed animals

Individuals with diseases of the immune system may be more susceptible to pneumonia and viral infections. The animal studies were not able to identify a level of PCB exposure that did not cause effects on the immune system.

In humans, a recent study found that individuals infected with Epstein-Barr virus had a greater association of increased exposures to PCBs. It also increased the risk of non-Hodgkins lymphoma more than for those who had no Epstein-Barr infection. This finding is consistent with increases in infection with Epstein Barr virus in animals exposed to PCBs.

Since PCBs suppress the immune system and immune system suppression has been demonstrated as a risk factor for non-Hodgkin's lymphoma, suppression of the immune system is a possible mechanism for PCB-induced cancer. Immune effects were also noted in humans who experienced exposure to rice oil contaminated with PCBs, dibenzofurans and dioxins.

Taken together, the studies in animals and humans suggest that PCBs may have serious potential effects on the immune systems of exposed individuals.

Reproductive Effects

Reproductive effects of PCBs have been studied in a variety of animal species, including Rhesus monkeys, rats, mice and mink. Rhesus monkeys are generally regarded as the best laboratory species for predicting adverse reproductive effects in humans. Potentially serious effects on the reproductive system were seen in monkeys and a number of other animal species following exposures to PCB mixtures. Most significantly, PCB exposures were found to reduce the birth weight, conception rates and live birth rates of monkeys and other species; and PCB exposure reduced sperm counts in rats. Effects in monkeys were long lasting and were observed long after the dosing with PCBs occurred.

Studies of reproductive effects have also been carried out in human populations exposed to PCBs. Children born to women who worked with PCBs in factories showed decreased birth weight and a significant decrease in gestational age with increasing exposures to PCBs. Studies in fishing populations believed to have high exposures to PCBs also suggest similar decreases. This same effect was seen in multiple species of animals exposed to PCBs, and suggests that reproductive effects may be important in humans following exposures to PCBs.

Neurological Effects

Proper development of the nervous system is critical for early learning and can have potentially significant implications for the health of individuals throughout their lives. Effects of PCBs on nervous system development have been studied in monkeys and a variety of other animal species. Newborn monkeys exposed to PCBs showed persistent and significant deficits in neurological development, including visual recognition, short-term memory and learning. Some of these studies were conducted using the types of PCBs most commonly found in human breast milk.

Studies in humans have suggested effects similar to those observed in monkeys exposed to PCBs, including learning deficits and changes in activity associated with exposures to PCBs. The similarity in effects observed in humans and animals provide additional support for the potential neurobehavioral effects of PCBs.

Endocrine Effects

There has been significant discussion and research on the effects of environmental contaminants on the endocrine system ("endocrine disruption"). While the significance of endocrine disruption as a widespread issue in humans and animals is a subject of ongoing study, PCBs have been demonstrated to exert effects on thyroid hormone levels in animals and humans. Thyroid hormone levels are critical for normal growth and development, and alterations in thyroid hormone levels may have significant implications.

It has been shown that PCBs decrease thyroid hormone levels in rodents. Research has also shown that these decreases result in developmental deficits in rodents, including deficits in hearing. PCB exposures have been associated with changes in thyroid hormone levels in infants in studies conducted in the Netherlands and Japan. Additional research will be required to determine the significance of these effects in the human population.

Other Non-cancer Effects

A variety of other non-cancer effects of PCBs have been reported, including the following:

- Dermal and ocular effects in monkeys and humans
- Liver toxicity in rodents
- Elevated blood pressure, serum triglyceride and serum cholesterol in humans

Integrated Risk Information System (IRIS)

EPA's Integrated Risk Information System (IRIS) Program <https://epa.gov/iris> identifies and characterizes the health hazards of chemicals found in the environment via individual assessments. Each IRIS assessment can cover a chemical, a group of related chemicals, or a complex mixture. The IRIS Program is located within EPA's National Center for Environmental Assessment (NCEA) in the Office of Research and Development (ORD). PCBs are a chemical where IRIS has completed a primary assessment and additional assessment work is ongoing.

Laws and Regulations

Statute: Toxic Substances Control Act (TSCA)

Additional Information

In addition, the Government Printing Office maintains a searchable database of all CFR publications and Federal Register (FR) Notices.

- Code of Federal Regulations
- Federal Register Notices <https://www.federalregister.gov/> (FR Notices)

The Toxic Substances Control Act of 1976 provides EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures, including PCBs. Some substances are generally excluded from TSCA, including but not limited to, food, drugs, cosmetics and pesticides. TSCA addresses the production, importation, use and disposal of specific chemicals including polychlorinated biphenyls (PCBs), asbestos, radon and lead-based paint. For more information see EPAs Summary of the Toxic Substance Control Act <https://epa.gov/laws-regulations/summary-toxic-substances-control-act> page.

PCB Regulations: Part 761 in Title 40 of the Code of Federal Regulations

Current PCB regulations, published pursuant to the TSCA statute, can be found in Title 40 of the Code of Federal Regulations (CFR) in Part 761. The Government Printing Office maintains the most current version of the CFR. View PCB regulations in the electronic-CFR. For useful interpretation of the regulations as well as answers to frequently asked questions please visit EPA's Policy and Guidance for PCBs page <https://epa.gov/pcbs/policy-and-guidance-polychlorinated-biphenyl-pcbs>.

Detailed List of PCB Federal Register Notices (As of September 6, 2012)

EPA publishes information about the PCB program through the Federal Register. The Federal Register Notices listed below include PCB-related rules (proposed and final), notices of public meetings, responses to official comments, etc. This is not a comprehensive list of current regulations. A searchable listing of EPA's Register Notices can be found on the Federal Digital System web page <https://www.federalregister.gov/>.

View the List of Federal Register Notices that Pertain to PCBs

Date	Type	Title	Citation
7/2/2015	Technical Amendment	Revisions to PCB Manifesting Regulations (Technical Correction)	80 FR 37994 <https://www.federalregister.gov/documents/2015/07/02/20 16395/polychlorinated-biphenyls-pcbs-revisions-to-manifesting-regulations-item-number>
9/29/2014	Final Rule	Polychlorinated Biphenyls: Manufacturing (Import) Exemption	79 FR 58266 <https://www.federalregister.gov/documents/2014/09/29/20 23104/polychlorinated-biphenyls-pcbs-manufacturing-impo exemption-for-the-defense-logistics-agency-dla>
9/6/2012	Direct Final Rule	Revisions to Manifesting Regulations	77 FR 54818 <https://www.federalregister.gov/documents/2012/09/06/20 21674/polychlorinated-biphenyls-pcbs-revisions-to-manifesting-regulations>
6/16/2010	Advance Notice of Proposed Rulemaking (ANPRM)	Polychlorinated Biphenyls (PCBs); Reassessment of Use Authorizations; Extension of Comment Period and Additional Public Meetings	75 FR 34076 <https://www.federalregister.gov/documents/2010/06/16/20 14522/polychlorinated-biphenyls-pcbs-reassessment-of-use authorizations-extension-of-comment-period-and>
4/7/2010	Advance Notice of Proposed Rulemaking (ANPRM)	Polychlorinated Biphenyls (PCBs); Reassessment of PCB Use Authorizations	75 FR 17645 <https://www.federalregister.gov/documents/2010/04/07/20 7751/polychlorinated-biphenyls-pcbs-reassessment-of-use-authorizations>
1/29/2010	Withdrawal of Proposed Rule	EPA Withdraws Proposed Rule for an Import Exemption for Veolia ES Technical Solutions, L.L.C. <https://www.federalregister.gov/documents/2008/04/21/e8-8560/polychlorinated-biphenyls-manufacturing-import-exemption-for-veolia-es-technical-solutions-llc>	75 FR 4759 <https://www.federalregister.gov/documents/2010/01/29/20 1943/polychlorinated-biphenyls-manufacturing-import-exemption-for-veolia-es-technical-solutions-llc>

10/9/2007	Procedural Rule	Transfer of Polychlorinated Biphenyl Cleanup and Disposal Program from the Office of Prevention, Pesticides and Toxic Substances (OPPTS) *(OPPTS renamed Office of Chemical Safety and Pollution Prevention, OCSPP, effective April 22, 2010)* to the Office of Solid Waste and Emergency Response (OSWER)	72 FR 57235 <https://www.federalregister.gov/documents/2007/10/09/e7 19841/transfer-of-polychlorinated-biphenyl-cleanup-and-disposal-program-from-the-office-of-prevention>
9/18/2007	**Final Rule**	Polychlorinated Biphenyls; Manufacturing (Import) Exemption	72 FR 53152 <https://www.federalregister.gov/documents/2007/09/18/e7 18345/polychlorinated-biphenyls-manufacturing-import-exemption>
5/25/2007	Notice of Application to Renew, Data Availability, and Modification of Existing Approval	Army Chemical Agent Rocket Incinerator Approval to Dispose of Polychlorinated Biphenyls under the Toxic Substances Control Act	72 FR 29317 <https://www.federalregister.gov/documents/2007/05/25/e7 10117/army-chemical-agent-rocket-incinerator-approval-to-dispose-of-polychlorinated-biphenyls-under-the>
4/30/2007	Proposed Rule	Polychlorinated Biphenyls; Manufacturing (Import) Exemption	72 FR 21190 <https://www.federalregister.gov/documents/2007/04/30/e7 8182/polychlorinated-biphenyls-manufacturing-import-exemption>
4/4/2006	Notice of Availability	Polychlorinated Biphenyl (PCB) Site Revitalization Guidance Under the Toxic Substances Control Act (TSCA)	71 FR 16703 <https://www.federalregister.gov/documents/2006/04/04/06 3206/polychlorinated-biphenyl-pcb-site-revitalization-guidance-under-the-toxic-substances-control-act>
6/30/2005	Notice of Public Meeting	Polychlorinated Biphenyls	70 FR 37837 <https://www.federalregister.gov/documents/2005/06/30/05 12916/polychlorinated-biphenyls-notice-of-public-meeting>
9/7/2004	Availability of Supplemental Response to Comments Document	Storage of PCB Articles for Reuse	69 FR 54025 <https://www.federalregister.gov/documents/2004/09/07/04 20222/storage-of-pcb-articles-for-reuse-availability-of-supplemental-response-to-comments-document>
6/20/2003	**Final Rule**	Polychlorinated Biphenyls (PCBs) - Use of Porous Surfaces, Amendment in Response to Court Decision	68 FR 36927 <https://www.federalregister.gov/documents/2003/06/20/03 15668/polychlorinated-biphenyls-use-of-porous-surfaces-amendment-in-response-to-court-decision>

1/31/2003	**Final Rule**	Polychlorinated Biphenyls; Manufacturing (Import) Exemptions	68 FR 4934 <https://www.federalregister.gov/documents/2003/01/31/03 2344/polychlorinated-biphenyls-manufacturing-import-exemptions>
9/17/2002	Proposed Rule	Polychlorinated Biphenyls; Manufacturing (Import) Exemptions	67 FR 58567 <https://www.federalregister.gov/documents/2002/09/17/02 23718/polychlorinated-biphenyls-manufacturing-import-exemptions>
4/2/2001	**Final Rule**	Reclassification of PCB and PCB-Contaminated Electrical Equipment	66 FR 17602 <https://www.federalregister.gov/documents/2001/04/02/01 8055/reclassification-of-pcb-and-pcb-contaminated-electric equipment>
3/30/2001	**Final Rule**	Polychlorinated Biphenyls (PCBs); Return of PCB Waste From U.S. Territories Outside the Customs Territory of the United States	66 FR 17468 <https://www.federalregister.gov/documents/2001/03/30/01 7920/polychlorinated-biphenyls-pcbs-return-of-pcb-waste-from-us-territories-outside-the-customs-territory>
11/1/2000	Proposed Rule	Polychlorinated Biphenyls (PCBs); Return of PCB Waste From US Territories Outside the Customs Territory of the United States	65 FR 65653 <https://www.federalregister.gov/documents/2000/11/01/00 27971/polychlorinated-biphenyls-pcbs-return-of-pcb-waste from-us-territories-outside-the-customs-territory>
4/6/2000	Proposed Rule	Use Authorization for and Distribution in Commerce of Non-Liquid Polychlorinated Biphenyls; Notice of Availability; Partial Reopening of the Comment Period; Extension of Comment Period	65 FR 18018 <https://www.federalregister.gov/documents/2000/04/06/00 8407/use-authorization-for-and-distribution-in-commerce-c non-liquid-polychlorinated-biphenyls-notice-of>
12/10/1999	Proposed Rule	Use Authorization for and Distribution in Commerce of Non-Liquid Polychlorinated Biphenyls; Notice of Availability; Partial Reopening of the Comment Period	64 FR 69358 <https://www.federalregister.gov/documents/1999/12/10/99 32079/use-authorization-for-and-distribution-in-commerce-non--liquid-polychlorinated-biphenyls-notice>
6/24/1999	**Final Rule**	Technical and Procedural Amendments to TSCA Regulations - Disposal of Polychlorinated Biphenyls (PCBs)	64 FR 33755 <https://www.federalregister.gov/documents/1999/06/24/99 16098/technical-and-procedural-amendments-to-tsca-regulationsdisposal-of-polychlorinated-biphenyls-pcbs>
6/29/1998	**Final Rule**	Disposal of Polychlorinated Biphenyls (PCBs)	63 FR 35384 <https://www.federalregister.gov/documents/1998/06/29/98 17048/disposal-of-polychlorinated-biphenyls-pcbs>
3/18/1996	**Final Rule**	Disposal of Polychlorinated Biphenyls; Import for Disposal	61 FR 11095 <https://www.federalregister.gov/documents/1998/06/29/98 17048/disposal-of-polychlorinated-biphenyls-pcbs>

2/9/1995	Notice of Informal Hearing	PCBs; Manufacturing, Processing and Distribution in Commerce Exemptions	60 FR 7742 <https://www.federalregister.gov/documents/1995/02/09/95-3297/polychlorinated-biphenyls-pcbs-manufacturing-processing-and-distribution-in-commerce-exemptions>
12/6/1994	Proposed Rule	Disposal of PCBs (Mega Amendments)	59 FR 62788 <https://www.federalregister.gov/documents/1995/03/10/95-5986/disposal-of-polychlorinated-biphenyls-pcbs-notice-of-informal-hearing>
12/6/1994		PCBs; Manufacturing, Processing and Distribution in Commerce; Proposed Decision on Exemption Petitions	59 FR 62875 <https://www.federalregister.gov/documents/1994/12/06/94-29569/polychlorinated-biphenyls-manufacturing-processing-and-distribution-in-commerce-proposed-decisions>
4/11/1994	Exemptions from Prohibition	PCBs	59 FR 16991 <https://www.federalregister.gov/documents/1994/04/11/94-8465/polychlorinated-biphenyls-exemptions-from-prohibiti against-manufacturing-processing-and>
11/18/1993	Proposed Rule	Reclassification of PCB and PCB-Contaminated Transformers	58 FR 60970
11/9/1993		Criteria for Granting Approval for Commercial Storage of PCBs for Disposal	58 FR 59372
6/8/1993		Use of Waste Oil	58 FR 32061
1/26/1993	Proposed Rule	Storage for Disposal of PCBs	58 FR 6184
4/16/1992		Revision of Test Methods Incorporated by Reference	57 FR 13322
3/2/1992	Proposed Rule	PCB Exemptions and Use Authorizations	57 FR 7349
9/10/1991		Receipt of Applications to Dispose of PCBs	56 FR 46180
6/10/1991		Receipt of Application to Operate PCB Storage Facility	56 FR 26673
6/10/1991	ANPR	Advanced Notice of Proposed Rulemaking for Disposal of PCBs	56 FR 26738
6/10/1991	Availability of Draft Guidance Documents	Availability of Draft Guidance on Disposal of PCBs	56 FR 26745

4/2/1991	Availability of Draft Guidance Documents	PCBs in Natural Gas Pipelines	56 FR 13473
3/4/1991		Availability and Review of PCB State Enhancement Grant Program	56 FR 9008
3/1/1991		Agency Information Collection Activities under OMB Review	56 FR 8759
2/13/1991		Agency Information Collection Activities under OMB Review; PCB Exemptions - Annual Submission Requirements	56 FR 5824
12/27/1990	Notice	Agency Information Collection Activities under OMB Review	55 FR 53187
11/26/1990	**Final Rule**	PCBs in Electrical Transformers	55 FR 49043
11/7/1990	**Final Rule**	Partial Rescission of Exemption Rule	55 FR 46790
11/7/1990	Proposed Rule	Disposal Approval	55 FR 46790
11/2/1990		Criteria and Procedures for Terminating Storage	55 FR 46470
10/31/1990	Corrections	PCBs in Electrical Transformers	55 FR 45804
9/24/1990		PCBs; Manufacturing, Processing, Distribution in Commerce Technical Amendment	55 FR 38998
9/13/1990	**Final Rule**	Stay of Interpretation	
8/31/1990		Receipt of application for Approval to Dispose of PCBs	55 FR 35720
6/27/1990	Correction	Notification and Manifesting for PCB Waste Activities	55 FR 26204
6/6/1990		Receipt of Application for Approval to Dispose of PCBs	55 FR 23134
5/22/1990	**Final Rule**	PCBs; Manufacturing, Processing, Distribution in Commerce Exemption	55 FR 21023
4/13/1990		Availability of PCB Penalty Policy	55 FR 13955
4/6/1990	Clarification	PCB; Wet Weight/Dry Weight	55 FR 12866

1/8/1990	Correction	Notification and Manifesting for PCB Waste Activities	55 FR 695
12/21/1989	**Final Rule**	Notification and Manifesting for PCB Waste Activities	54 FR 52716
9/12/1989	Reopening of Comment Period	PCB Exemptions	54 FR 37698
7/6/1989	Correction	PCB in Electrical Transformers	54 FR 28418
5/19/1989	**Final Rule**	Procedures for Rulemaking under Section 6 of TSCA	54 FR 21622
11/9/1988	Extension of Comment Period	Notification and Manifesting for PCB Waste Activities	53 FR 45288
10/28/1988		Receipt of application for Approval to Dispose of PCBs	53 FR 43767
10/19/1988	Amendment and Clarifications	PCB Spill Cleanup Policy	53 FR 40882
9/26/1988	Proposed Rule	Notification and Manifesting for PCB Waste Activities	53 FR 37436
9/1/1988	Correction	PCBs in Electrical Transformers	53 FR 33897
8/24/1988	Correction	PCBs; Manufacturing, Processing and Distribution in Commerce Exemptions	53 FR 32326
8/2/1988		PCB Exclusions, Exemptions and Use Authorizations; Correction	53 FR 29114
7/19/1988	**Final Rule**	PCBs in Electrical Transformers	53 FR 27322
7/1/1988	Correction	PCB and Chemical Fate Test Guidelines	53 FR 25049
6/27/1988	**Final Rule**	Exclusion, Exemptions and Use Authorizations	53 FR 24206
6/9/1988	**Final Rule**	PCB and Chemical Fate Testing Guidelines; Incorporation by Reference Update	53 FR 21641

5/25/1988		Receipt of Application for Approval to Dispose of PCBs	53 FR 18900
5/18/1988	Notice of Receipt of Application	Receipt of Application for Approval to Dispose of PCBs	53 FR 11761
4/5/1988	Proposed Revisions of Incorporation by Reference	PCB and Chemical Fate Testing Guidelines	53 FR 11104
3/31/1988		PCB and Chemical Fate Testing Guidelines, Reapproved Test Methods	53 FR 10390
9/18/1987	Corrections	PCBs in Electrical Transformers	52 FR 35350
9/4/1987	Corrections	PCBs; Exclusions, Exemptions and Use Authorizations	52 FR 33680
8/21/1987	Proposed Rule	PCBs in Electrical Transformers	52 FR 31738
7/8/1987	Proposed Rule	PCBs; Exclusions, Exemptions and Use Authorizations	52 FR 25838
7/2/1987	Denial of Citizens' Petition	PCBs	52 FR 25068
6/19/1987	Corrections	PCB Spill Cleanup Policy	52 FR 23397
4/2/1987	**Final Rule**	PCB Spill Cleanup Policy	52 FR 10688
1/9/1987	Response to Citizens' Petition	PCBs	52 FR 862
12/8/1986		Clarification of the Use of Electrical Transformers	59 FR 47241
8/8/1986	**Final Rule**	Response to Exemption Petitions	51 FR 28556
8/29/1985	Denial of Exemption Petition	Response to Exemptions Petitions; Proposed Rule and Response to Ward Transfer Co. Petition for Exemption	50 FR 35182
7/17/1985	**Final Rule**	PCBs in Electrical Transformers	50 FR 29170

4/4/1985	Proposed Incorporation by Reference Revision	PCBs	50 FR 13393
2/8/1985	Extension of Comment Period	PCBs; Use in Electrical Transformers	50 FR 5401
11/28/1984	Correction	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Electrical Transformers	49 FR 46770
11/8/1984		Modification of Definition of Totally Enclosed Manner for PCB Activities	49 FR 44634
10/11/1984	Proposed Rule	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Electrical Transformers	49 FR 39966
9/19/1984	Incorporation by Reference	PCBs	49 FR 36648
8/20/1984	Correction	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions, Exclusions, Exemptions and Use Authorizations	49 FR 33019
7/23/1984	Proposed Rule	PCBs, Modification of Definition of Totally Enclosed Manner for PCB Activities	49 FR 29625
7/18/1984	Technical Amendment	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions	49 FR 29066
7/18/1984	Editorial Amendment of Definition Correction	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions	49 FR 29066
7/10/1984		PCBs; Final Rules and Notice of Request for Additional Comments on Certain Individuals and Class Petitions for Exemption	49 FR 28154
7/10/1984	Exclusions and Authorizations	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions	49 FR 28172
7/10/1984		PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Microscopy and Research and Development	49 FR 28193

7/10/1984		PCBs; Request for Additional Comments on Certain Individual Class Petitions for Exemptions	49 FR 28203
6/20/1984	Editorial Amendment of Definition	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions	49 FR 25239
6/1/1984	Proposed Incorporation by Reference Revision	PCBs	49 FR 22836
3/22/1984	ANPR	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Electrical Transformers	49 FR 11070
3/19/1984		PCBs; Withdrawal of Proposed Rule Prohibitions at Agricultural Chemical Facilities	49 FR 10133
1/13/1984	Denial of Citizens' Petition	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions	49 FR 1697
12/8/1983	Proposed Rule	PCBs, Exclusions, Exemptions and Use Authorizations	48 FR 55076
11/23/1983	Correction	PCBs; Manufacturing, Processing, Distribution in Commerce Exemptions	48 FR 52953
11/17/1983		PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Microscopy and Research and Development	48 FR 52402
11/17/1983		TSCA Statement of Policy for Compliance and Enforcement of PCB Storage for Disposal Regulations	48 FR 52304
11/1/1983		PCBs; Manufacturing, Processing, Distribution in Commerce Exemptions	48 FR 50486
5/10/1983	Notice of Availability and Summary Report	Availability of Report; Monitoring Results and Environmental Impact on the Gulf of Mexico Incineration of PCBs under Research Permit H81-002; 4/83	48 FR 20984

4/20/1983	Denial of Citizens' Petition; Rule Related Notice	PCBs; Manufacturing Processing, Distribution in Commerce, and Use Prohibitions	48 FR 16884
4/7/1983		PCBs; Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Incorporation by Reference Revisions; Correction; Final Rule; Correction (corrects "batch testing" procedures of FR 2/8/83)	48 FR 15125
3/30/1983	Procedural Rule Amendment and Statement of Policy	PCBs; Procedural Amendment of the Approval Authority for PCB Disposal Facilities and Guidance for Obtaining Approval	48 FR 13181
2/18/1983	Statement of Policy	PCB Use in Electrical Equipment	48 FR 7172
2/8/1983	**Final Rule**	PCB Incorporation by Reference Revisions	48 FR 5729
2/1/1983	Correction	PCB Manufacture, Processing, Distribution and Use in Closed and Controlled Waste Manufacturing Processes	48 FR 4467
1/3/1983	**Final Rule**	Use Authorization for PCB Railroad Transformers	48 FR 124
12/28/1982	Correction	NIOSH/OSHA: Field Research Projects	47 FR 57774
12/28/1982	Correction	PCB Use in Electrical Equipment	47 FR 54436
12/28/1982		Pulp, Paper and Paperboards Point Source Category Effluent Limitations Guidelines and New Source Performance Standards; Proposed Regulation (Clean Water Act)	47 FR 52066
12/28/1982	Proposed Rule	Ocean Dumping; Proposed Designation of At-Sea Incineration Site	47 FR 51769
12/28/1982	**Final Rule**	PCB Manufacture, Processing, Distribution and Use in Closed and Controlled Waste Manufacturing Processes	47 FR 46980
12/28/1982	Denial of Citizens' Petition	PCB Regulation of MCBs and DCBs	47 FR 46723

12/28/1982	**Final Rule**	PCB Use in Electrical Equipment	47 FR 37342
12/28/1982	Denial of Citizens' Petition	PCB Regulations of MCBs	47 FR 37258
7/13/1982	Extension of Comment Period	PCB Incorporation by Reference Revisions	47 FR 30270
7/13/1982		Notice of Availability of Guidelines for the Analysis of PCBs	47 FR 30082
7/13/1982	Notice of Informal Hearing	PCBs; Manufacturing, Processing, Distribution in Commerce and Use in Closed and Controlled Waste Manufacturing Process	47 FR 30082
7/13/1982	Proposed Rule	PCBs; Manufacturing, Processing, Distribution in Commerce and Use in Closed and Controlled Waste Manufacturing Process	47 FR 24976
7/13/1982	**Final Rule**	PCB Incorporation by Reference Update	47 FR 22098
7/13/1982	Proposed Rule	PCB Incorporation by Reference Revisions	47 FR 22123
7/13/1982	**Final Rule**	PCB Recodification	47 FR 19526
7/13/1982	Proposed Rule	PCB Use in Electrical Equipment	47 FR 17426
7/13/1982	Denial of Citizens' Petition	PCB Disposal and Research and Development Activities	47 FR 2379
11/18/1981	Proposed Rule	Use Authorization for PCB Railroad Transformers	46 FR 56626
5/20/1981	Clarification of Interim Measures Program	PCB Use in Electrical Equipment	46 FR 27614
5/20/1981	Court Order	PCBs at Concentrations Below 50 ppm	46 FR 27615
5/20/1981	ANPR	PCBs at Concentrations Below 50 ppm; Possible Exclusion from Manufacturing Ban	46 FR 27617
5/20/1981	ANPR	PCBs at Concentrations Below 50 ppm	46 FR 27619

5/6/1981	Abeyance of Proposed Rule	Restrictions on Use of PCBs at Agricultural Pesticide and Fertilizer Facilities	46 FR 25418
3/10/1981	Court Order	PCB Use in Electrical Equipment	46 FR 16090
3/10/1981	ANPR	PCB Use in Electrical Equipment	46 FR 16095
12/23/1980	Extension of Comment Period	Restrictions on Use of PCBs at Agricultural Pesticide and Fertilizer Facilities	45 FR 84828
12/4/1980	Denial of Citizens' Petition	Use of PCBs in Floor Sweep Compounds	45 FR 80320
10/28/1980	Extension of Comment Period; Announcement of Informal Public Meeting	Restrictions on Use of PCBs at Agricultural Pesticide and Fertilizer Facilities	45 FR 71364
9/10/1980	Policy Guidelines	PCB Penalty Policy	45 FR 59790
7/14/1980	Extension of Comment Period	Restrictions on Use of PCBs at Agricultural Pesticide and Fertilizer Facilities	45 FR 47168
5/9/1980	Proposed Rule	Restrictions on Use of PCBs at Agricultural Pesticide and Fertilizer Facilities	45 FR 30989
5/1/1980		Expiration of the Open Border Policy for PCB Disposal	45 FR 29115
4/16/1980	Extension of Comment Period	Request for Information on PCB Transformers (published 3/5/80)	45 FR 25828
3/28/1980	Final Amendment	Disposal Requirements for PCB Capacitors in Chemical Waste Landfills	45 FR 20473
3/5/1980		Policy Statement on Future Exemption Petitions	45 FR 14247
3/5/1980		Request for Information on PCB Transformers ("Weeping" or "Sweating")	45 FR 14232

11/29/1979	Proposed Amendment Clarification	PCB Hydraulic Machines	44 FR 68489
11/21/1979	Proposed Amendment	Disposal Requirements for Large PCB Capacitors in Chemical Waste Landfills	44 FR 66851
10/2/1979	Proposed Rule and Interim Guidance	Notification of Export of PCBs;	44 FR 56856
9/19/1979		Disposal Requirements; Immediately Effective Amendment to the 5/31/79 Final Rule Comment Period	44 FR 54296
7/20/1979	Notice of Additional Petitions and Extensions of Reply Comment	PCBs; Manufacturing Exemptions	44 FR 42727
7/9/1979	Denial of Citizens' Petition	Disposal of PCB Contaminated Soil and Debris	44 FR 40132
5/31/1979	Proposed Rule	Amendment to Criteria for Chemical Waste Landfills	44 FR 31567
5/31/1979	Proposed Rule	Manufacturing Exemptions	44 FR 31564
5/31/1979		Interim Procedural Rules for Exemptions from the PCB Processing and Distribution in Commerce Bans PCBs;	44 FR 31558
5/31/1979	**Final Rule**	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Bans	44 FR 31514
3/12/1979	Citizens' Petition	Disposal of PCB Contaminated Soil and Debris	44 FR 13575
1/2/1979		Policy for Implementation and Enforcement of PCB Ban Rule	44 FR 108
11/1/1978		Interim Procedural Rules for Exemptions from PCB Manufacturing Ban	43 FR 50905

9/22/1978	Extension of Reply Comment Period	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Bans	43 FR 43048
8/25/1978	Clarification	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Bans	43 FR 38057
8/2/1978		PCB Addendum to Preamble and Correction to Final Rule published 2/17/78	43 FR 33918
6/7/1978	Proposed Rule	PCBs; Manufacturing, Processing, Distribution in Commerce and Use Bans	43 FR 24802
2/17/1978	**Final Rule**	PCBs; Marking and Disposal	43 FR 7150
12/2/1977	**Final Rule**	Procedures for Rulemaking under Section 6 of TSCA	42 FR 61259
6/27/1977	Solicitation of Comments	PCB Open Public Meeting;	42 FR 32555
5/24/1977	Proposed Rule	PCB Marking and Disposal	42 FR 26564
4/1/1976		PCB Containing Waste; Disposal Procedures	41 FR 14133

PCBs and Hazardous Waste

PCBs are not defined as hazardous wastes (Memo, Weddle to Verde; May 18, 1984 - RCRA Online Number 12235 <https://rcrapublic.epa.gov/files/12235.pdf>). However, it is possible that PCBs may be incidental contaminants in listed hazardous waste (e.g., solvent used to remove PCBs from transformers) or may be present in wastes that are characteristically hazardous. In these cases, wastes that otherwise meet a listing criteria or are characteristically hazardous are still subject to RCRA regulation regardless of PCB content.

However, to avoid duplicative regulation with Toxic Substances Control Act (TSCA), certain PCB containing wastes that exhibit the toxicity characteristic are exempt from regulation under RCRA (Monthly Call Center Report Question; September 1996 - RCRA Online Number 14014 <https://rcrapublic.epa.gov/files/14014.pdf>). Section 261.8 exempts from RCRA Subtitle C regulation PCB-containing dielectric fluid and the electric equipment which holds such fluid if they satisfy two criteria. First, these PCB wastes must be regulated under the TSCA standards of Part 761. Second, only the PCB wastes which exhibit the toxicity characteristic for an organic constituent (waste codes D018-43) may qualify for the exemption (§261.8).

States may also have a regulatory program which is more stringent or broader in scope than the Federal program. Many state have expanded their universe of regulated wastes to cover additional waste (e.g., PCBs) not defined as hazardous under the Federal program. Individuals should check with their state to see if they are subject to any state requirements.

Additional information regarding the regulation of PCBs under RCRA is available in the following guidance documents:

- Memo, Lowrance to Wassersug; September 22, 1989 - RCRA Online Number 11470 <https://rcrapublic.epa.gov/files/11470.pdf>
- Memo, Porter to McCloskey; April 26, 1986 - RCRA Online Number 11144 <https://rcrapublic.epa.gov/files/11144.pdf>

Polychlorinated Biphenyls (PCBs): Revisions to Manifesting Regulations

EPA updated and clarified several sections of the PCB regulations associated with the manifesting requirements. This was done to the greatest extent possible to match the manifesting requirements for PCBs under the Toxic Substances Control Act (TSCA) to those of Resource Conservation and Recovery Act (RCRA).

- Federal Register: Proposed Rule <http://www.regulations.gov/#!documentdetail;d=epa-hq-rcra-2011-0524-0003> - September 6, 2012

The docket for this rulemaking is EPA-HQ-RCRA-2011-0524 <http://www.regulations.gov/#!docketdetail;d=epa-hq-rcra-2011-0524> and can be accessed at Regulations.gov <http://www.regulations.gov>.

The comment period closed November 5, 2012. No adverse comments on the rule were received, so the direct final rule took effect December 5, 2012.

- Federal Register: Direct Final Rule <http://www.regulations.gov/#!documentdetail;d=epa-hq-rcra-2011-0524-0001> - September 6, 2012

Frequent Questions about Revisions to Manifesting Regulations

- **Why has EPA developed these changes?**

EPA issued this direct final rule to update and clarify several sections of the PCB regulations associated with manifesting requirements. This update streamlined regulations for the safe management of PCBs making it easier for industry to understand and follow PCB manifest regulations. Specifically, this update matches the manifesting requirements for PCBs under the TSCA to those of RCRA to the greatest extent possible.

- **What new regulations are involved in this change?**

The existing PCB manifest regulations are in 40 CFR part 761. The RCRA manifest regulations are in 40 CFR parts 262, 263, and 264. Since the promulgation of the PCB manifest regulations, several updates have been made to the RCRA manifest regulations where the corresponding changes have not been made to the PCB manifest regulations. The intent of these changes is to align the manifesting requirements for PCBs with the RCRA hazardous waste requirements. These changes are necessary because PCB wastes are manifested using the RCRA Uniform Hazardous Waste Manifest. PCB waste handlers and generators must also adhere to the more recent RCRA hazardous waste manifest regulations, while still accounting for certain unique PCB manifest regulations. Since PCBs are manifested using the same manifest as RCRA hazardous waste, all changes to part 761 are being implemented by PCB waste handlers and generators. This does not include the exemption to manifest waste transported on a right-of-way (40 CFR 262.20(f)).

- **What RCRA manifest regulatory requirements do not exist in the PCB manifest regulations?**

EPA compared the PCB manifest regulations (40 CFR part 761) to the RCRA manifest regulations (40 CFR parts 262, 263, and 264) to determine which sections from the RCRA manifest regulations do not exist in the PCB manifest regulations. Below is a table of the regulations from 40 CFR parts 262-264 EPA is adding to 40 CFR part 761 where the content of the section will be new to 40 CFR part 761. Like the other changes in this rule, explanations for the changes below are included in the subsequent sections in this direct final rule. In addition to this direct final rule, EPA will include in the docket a crosswalk between the RCRA manifest regulations and the PCB manifest regulations.

40 CFR Section	Brief Description of RCRA Regulation
262.20(c)	Designating an alternate facility on the manifest
262.20(f)	Manifesting exemption for the transport of waste on a public or private right-of-way within or along the border of contiguous property
262.23(f)	Generator requirements for rejected shipments returned by the receiving facility back to the generator. (Language on non-empty containers and residues is not relevant to PCB waste.)
262.40(b)	Three-year exception report retention requirement for generators
263.21(a)(2)	Alternate designated facility is listed as one of the options that the transporter must deliver the waste to

40 CFR Section	Brief Description of RCRA Regulation
263.21(b)(2)	Partial and full load rejection requirements if the waste is rejected while the transporter is on the facility's premises
264.71(a)(1)	Facility signs and dates the manifest when the waste was received, except as noted in the discrepancy space of the manifest, or when the waste was rejected as noted in the manifest discrepancy space
264.72(a)(2)	Definition of rejected wastes as manifest discrepancies
264.72(d)	Upon rejecting waste, the facility must consult with the generator prior to forwarding the waste to another facility. The facility must send the waste to another facility or back to the generator within 60 days of the rejection. While making arrangements for the rejected waste, the facility must ensure that the transporter retains custody or the facility provides secure, temporary custody of the waste.
264.72(e)	Facility requirements for preparing a new manifest for full or partial load rejections that are to be sent off-site to an alternate facility
264.72(f)	Facility requirements for preparing a new manifest for rejected wastes that must be sent back to the generator
264.72(g)	Facility requirements for amending the manifest for rejected wastes after the facility has signed, dated, and returned the manifest to the delivering transporter or to the generator
264.76(a)(6)	Report on un-manifested waste must include the certification signed by the owner, operator, or authorized representative of the facility

PCBs Home <https://epa.gov/pcbs>

Learn about PCBs

Policy and Guidance <https://epa.gov/pcbs/policy-and-guidance-polychlorinated-biphenyl-pcbs>

Cleanups <https://epa.gov/pcbs/managing-remediation-waste-polychlorinated-biphenyls-pcbs-cleanups>

Cleanup of PCB Waste <https://epa.gov/pcbs/managing-remediation-waste-polychlorinated-biphenyls-pcbs-cleanups>

Facility Approval Streamlining Toolbox (FAST) <https://epa.gov/pcbs/pcb-facility-approval-streamlining-toolbox-fast-streamlining-cleanup-approval-process>

Risk -based Disposal Approvals <https://epa.gov/pcbs/nationwide-risk-based-pcb-remediation-waste-disposal-approvals>

Disposal and Storage <https://epa.gov/pcbs/disposal-and-storage-polychlorinated-biphenyl-pcb-waste>

Commercial Storage and Disposal Facilities <https://epa.gov/pcbs/list-approved-polychlorinated-biphenyl-pcb-commercial-storage-and-disposal-facilities>

PCBs in Building Materials <https://epa.gov/pcbs/polychlorinated-biphenyls-pcbs-building-materials>

Regional PCB Programs <https://epa.gov/pcbs/epa-regional-polychlorinated-biphenyl-pcb-programs>

Contact Us <https://epa.gov/pcbs/forms/contact-us-about-polychlorinated-biphenyls-pcbs> to ask a question, provide feedback, or report a problem.

Exhibit C

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

Edward E. Bonner, Chief
Regulatory Branch
Department of the Army
Philadelphia District Corps of Engineers
Wanamaker Building, 100 Penn Square East
Philadelphia, Pennsylvania 19107-3390

DEC - 8 2017

RE: CENAP-OP-R-2017-0181 Delaware River Partners, LLC

Dear Mr. Bonner,

Enclosed is the biological opinion (Opinion), issued under Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, for the U.S. Army Corps of Engineers' (USACE) permitting of the Delaware River Partners Gibbstown Terminal and Logistic Center (CENAP-OP-R-2017-0181).

In this Opinion, we consider effects of the construction of the terminal and logistic center and effects of interrelated and interdependent activities. Interrelated and interdependent activities include commercial vessel traffic traveling to and from the terminal, on- and off-loading of cargo, and storm water management during a 30-year period of operation of the terminal. We conclude that the proposed action is likely to adversely affect, but not likely to jeopardize the continued existence of endangered shortnose sturgeon, the threatened Gulf of Maine Distinct Population Segment (DPS) of Atlantic sturgeon, the endangered New York Bight, Chesapeake Bay, or South Atlantic DPS of Atlantic sturgeon. We further conclude that the proposed action may affect, but is not likely to adversely affect the endangered Carolina DPS of Atlantic sturgeon, endangered green sea turtles, endangered leatherback sea turtles, the threatened Northwest Atlantic DPS of loggerhead sea turtles, endangered Kemp's ridley sea turtles, endangered North Atlantic right whales, or endangered fin whales. We also conclude that the development and operation of the terminal and logistic center may affect but is not likely to adversely affect critical habitat designated for the New York Bight DPS of Atlantic sturgeon.

As explained in this Opinion, we anticipate that the construction and operation of the proposed marine terminal will result in an increase of 91 large commercial cargo vessels transiting the Delaware River each year than currently occur. We anticipate that this will result in an increase in vessel strikes of shortnose and Atlantic sturgeon and that six Atlantic sturgeon (four New York Bight DPS, one Chesapeake Bay DPS or one from either the South Atlantic DPS or GOM DPS) and one shortnose sturgeon will be killed over the 30 year period that the marine terminal will be operational. No other take is anticipated.

While you are authorizing dredging and the construction of the in-water portions of the proposed Marine Terminal under your regulatory authorities, you have indicated that the USACE has no authority to regulate or control any of the vessels that may utilize the marine terminal over its 30-year life. Additionally, the applicant has indicated that while they can produce a reasonable estimate of the number of vessels that will utilize the marine terminal over its 30 year life, they stated that they cannot predict which vessels will use the terminal and that they have no means to regulate or control the operations of those vessels outside the marine terminal (i.e., along the transit route in the Delaware River where we expect vessel strikes to occur). Because it is these vessels that will cause the anticipated take, the vessel operators could be numerous, disparate and are of unknown identity, and neither the action agency nor the applicant have any authority to control these vessels, we are not exempting any take resulting from these vessels' transits. For the same reasons we are not including any reasonable and prudent measures or terms and conditions.

This concludes formal consultation on the proposed action. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may not have been previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species; or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

Thank you for working cooperatively with my staff throughout the consultation process. We look forward to continuing to work with your office to minimize the effects of construction projects in the Philadelphia District on listed species and critical habitat. Should you have any questions about this correspondence please contact Peter B. Johnsen at (978) 282-8416 or by e-mail (Peter.B.Johnsen@noaa.gov).

Sincerely,

for John K. Bullard
Regional Administrator

EC: Greene, NMFS/HCD
Johnsen, NMFS/PRD
Slavitter, USACE/Philadelphia District

File Code: ACOE\Formal\2017\ CENAP-OP-R-2016-0181-39 DRP Gibbstown Logistic Center
PCTS: NER-2017-14371

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

BIOLOGICAL OPINION

Agency: **U.S. Army Corps of Engineers, Philadelphia District**

Activity: **CENAP-OP-R- 2016-0181-39 DRP Gibbstown Shipping Terminal and Logistic Center**

NER-2017-14371

Conducted by: NOAA's National Marine Fisheries Service

Greater Atlantic Regional Fisheries Office

Date Issued: DEC - 8 2017

Approved by: Kimberly B. Damon-Randall quantifiable, NMFS believes that ongoing state fishing activities may be responsible for seasonally high levels of observed stranding of sea turtles on both the Atlantic and Gulf of Mexico coasts. Most of the state data are based on extremely low observer coverage or sea turtles were not part of data collection. Therefore, these data provide insight into gear interactions that could occur, but are not indicative of the magnitude of the overall problem. Certain gear types may have high levels of sea turtle takes, but very low rates of serious injury or mortality. For example, the hook and line takes rarely result in death, but trawls and gillnets frequently do. Leatherbacks seem to be susceptible to a more restricted list of fisheries, while the hard shelled turtles, particularly loggerheads, seem to appear in data on almost all of the state fisheries. Nearshore and inshore gillnet fisheries of the mid-Atlantic operating in Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina state waters and/or Federal waters and the bottom trawl horseshoe crab fishery in Delaware are of particular concern (NMFS 2016b).

6.3 Other Impacts of Human Activities in the Action Area

Other anthropogenic stressors in the action area include water and sediment quality and private and commercial actions. These stressors are detailed below.

6.3.1 *Contaminants and Water Quality*

Water quality in riverine and estuarine systems is affected by human activities conducted in the riparian zone, as well as those conducted more remotely in the upland portion of the watershed (NMFS 2017). Large portions of the Delaware River are bordered by highly industrialized waterfront development, including the largest freshwater port complex in the world (Delaware River Port Complex), as well as the nation's third largest petrochemical port and five of the largest U.S. east coast refineries (DRBC 2016). This development contributes to temperature variations, and releases of metals, dioxins, dissolved solids, phenols and hydrocarbons, any of which may be acutely or chronically toxic to fish, depending on dose. Industrial development, especially the presence of refineries, has resulted in storage and leakage of hazardous material into the Delaware River. A total of 13 Superfund sites are located in Marcus Hook; an additional hazardous waste site has not been designated as a Superfund site (NMFS 2015).

Because high levels of PCBs have resulted in state-issued fish consumption advisories for certain species caught in the Delaware Estuary, these waters were and continue to be listed as impaired, requiring the establishment of a PCB total maximum daily load (TMDL). A TMDL expresses the maximum amount of a pollutant that a water body can receive and still attain water quality standards (DRBC 2017).

Historically, shortnose sturgeon were rare in the area below Philadelphia, likely as a result of poor water quality precluding migration further downstream. However, in the past 20 to 30 years, the water quality has improved and sturgeon have been found farther downstream.

Through the early 1970s, DO concentrations in the river between Wilmington and Philadelphia regularly dropped below levels that could support aquatic life from late spring through early fall. Since 1990, DO concentrations have remained above minimum state standards throughout the entire year (R. Greene, DNREC, pers. comm. 1998, as cited in ASSRT 2007). Despite improvements in Delaware River water quality over the last two decades, Moberg and DeLucia (2016) reported that minimum daily DO concentrations were above 5.0 mg/L in 90% of the observations during years when sturgeon recruitment was observed. The median minimum daily DO concentration during such years exceeded 6.0 mg/L during the spawning and egg and larval development periods. During years when recruitment was not observed, median minimum daily DO concentrations was between 4.0 and 5.0 mg/L, and conditions were frequently less than 4.0 mg/L. Low DO concentration also corresponded to period of increased water temperature and decreased flow in the river. Factors impacting flow, temperature, and DO concentrations include upstream reservoir operation, water withdrawals, and climate variability.

Contaminants such as metals, PAHs, pesticides, and PCBs can adversely affect aquatic life, including sturgeon. Endocrine disrupting chemicals (EDCs), including PCDDs/TCDFs, DDE, PCBs and cadmium, have been detected in tissue of shortnose sturgeon caught in the Delaware River and are linked to reproductive and developmental disorders in other species (SSSRT 2010). Early life stages of sturgeon may be particularly sensitive to high concentrations of contaminants (Chambers et. al. 2012). No targeted studies of chemical contamination in shortnose sturgeon have been conducted, but it is likely that industrialization in rivers may adversely impact the species (NMFS 2015). The SSSRT ranked poor water quality as a moderately high risk for shortnose sturgeon in the Delaware River (SSSRT 2010).

Riverfront development has the potential to alter the connectivity between the river and the adjacent floodplain and to disrupt natural processes, such as sediment and nutrient transfer (Noe and Hupp 2005 – got pdf, add to EndNote). Due to historical development and industrial use, much of the lower Delaware River is disconnected from the floodplain by berms and raised shorelines.

The states of New Jersey, Delaware and the Commonwealth of Pennsylvania have been delegated authority to issue NPDES permits by the EPA. These permits authorize the discharge of chemicals in the action area. Permittees include municipalities for wastewater treatment plants and other industrial users. The states will continue to authorize discharge of waters through State Pollution Discharge Elimination System (SPDES) permits.

6.3.2 *Sediment Quality*

6.3.2.1 Wharf Area Investigation

On behalf of the previous site owner (Chemours), AECOM (2016) investigated sediment contamination near the existing wharf (i.e. the wharf area, which is the nearshore portion of the dredging area). This investigation was completed in accordance with AECOM's Wharf and Outfall Investigation Work Plan (Work Plan), submitted to the NJDEP on February 12, 2016. Ten sediment cores were collected within the Wharf Area. Samples were collected from each core and analyzed for extractable petroleum hydrocarbons (EPH), PAHs, aniline, diphenylamine, nitrobenzene, metals, Total Organic Carbon (TOC), grain-size distribution, oxidation reduction potential and pH. Sediment chemistry results were compared to New Jersey Ecological Screening Criteria (ESCs) and background sediment concentrations to determine whether there was indication of potential historical releases within the Wharf Area. A total of 10 background samples were collected from upstream and downstream locations near the site's property boundary. The investigation concluded that there has been limited, if any, release of organic compounds in the Wharf Area sediments, and that those sediments do not warrant further evaluation. Comparisons to the background dataset, collected as a part of this evaluation, also indicate that concentrations of organic and inorganic constituents, as a whole, are consistent with

Exhibit D

Delaware River Basin Commission

Implementation of the PCB TMDLs in the Delaware Estuary and Bay

EPA Region III

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Gregory J. Cavallo, P.G.

February 20, 2018

Outline

- PCBs structure and nomenclature
- PCB TMDL background
- Data Quality Objectives and Data Management
- Goal of PCB Trackback
- PMP Elements and Approaches
- Examples

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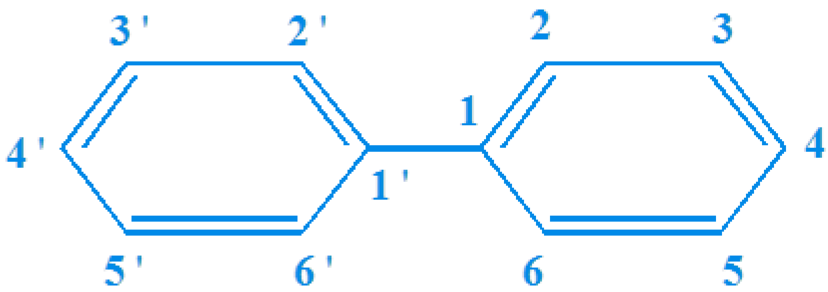

PCB Chemistry

- Polychlorinated biphenyls (PCBs) are man-made organic chemicals with a biphenyl base structure and 209 possible chlorine substitution patterns.
- Terminology: Aroclors, congeners, homologs.
- Properties: Hydrophobic, accumulate in sediments and tissues *(§303(d) listing of the estuary and bay by all 3 estuary states based upon fish tissue contamination is driver for PCB TMDLs)*
- Carcinogenic, and non-carcinogenic

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Point Source Requirements Stage 1 TMDLs

- Implementation requirements for point sources. Requirements consisted of:

  a. Monitoring using a sensitive analytical method (Method 1668A) for all 209 congeners.

  b. Develop and implement a Pollutant Minimization Plan (PMP) to identify and reduce sources of PCBs.

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Standardized Data Quality Objectives

Reduce analytical uncertainty and improve comparability between samples by:

- Establishing sample collection and identification protocols
- Specifying DRBC project specific analytical (Method 1668A) and reporting protocols to achieve detection limits in the single pg/L range
- Establishing Method and Rinsate blank contamination acceptability criteria
- Incorporating all data into an Access database

Monitoring Resources http://www.nj.gov/drbc/quality/toxics/pcb.html

Benefits of Standardized Sampling and Analysis

- Greater accuracy in estimated loadings
  - Including fingerprinting and evaluation of trackback efforts
- Increased modeling accuracy
- More accurate long-term trends analysis
- Better temporal and spatial evaluation of data
- Data reliability and transferability

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Pollutant Minimization Plans (PMPs)
Initial Plan Elements

1. Good Faith Commitment
2. Facility Description and Contact Information
3. Known and Potential Source evaluation
4. Strategy for Identify Unknown Sources (Track-Down)
5. Previous Minimization Activities and Measures
6. Source Prioritization
7. Key Dates
8. Measuring, Demonstrating, and Reporting Progress
9. Annual Report

PMP Resources:
http://www.nj.gov/drbc/programs/quality/pmp.html

PMP Review

- The Commission jump started the PMP process by requiring 42 discharges to develop initial PMPs beginning in 2005 using its own authority.
- Subsequent PMP requirements were incorporated into NPDES permits as were the continuation of existing PMPs originally required by the Commission.
- Initial PMP reviews were undertaken by Commission staff and subsequently by State representatives and if adequate, a completeness determination letter was issued and the PMP clock started

Preparation and Submission of a PMP Annual Report

Five Main Elements in the Annual Report:

1. PMP Achievement Executive Summary
2. Revisions to PMP
3. Material and Process Modifications
4. Measures to Address Known, Probable, and Potential Sources
5. Incremental and Cumulative changes from the baseline loading
6. Tabular Summary

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PMP Implementation Approaches

- Identify Known or Potential PCB Sources
  - Transformers and switches
  - Contaminated soils
  - Hydraulic fluids
  - Lubricants, gasket sealers, paints, plasticizers, adhesives
- Control solids
  - Stormwater controls, geotextile filters
  - Remove pathways for contaminated solids
  - Cleaning sediment from interceptors and pump stations
  - Increasing solids removal from municipal and industrial treatment systems
- Investigate inadvertent PCB production

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Trackback Strategies

- Develop strategy for collecting samples “upstream” of discharge to more accurately identify areas of concern
- Review pretreatment and residual program permits to identify potential sources of PCBs
- Identification of PCB contaminated sites using
  - EPA and State lists
- Use The North American Industry Classification System (NAICS) to identify potential sources
- Use Geographical Information System (GIS) approach to focus trackback efforts

Trackback Goals:
Identify sources of PCBs and reduce loadings

- Develop sampling and analytical plan
  - Identify sampling locations
  - Grab vs composite
  - Dry and/or wet weather samples
- Select a method which is sufficiently sensitive to provide the PCB information need to calculate PCB mass:
  - *PCB Conc. X Flow= PCB mass*

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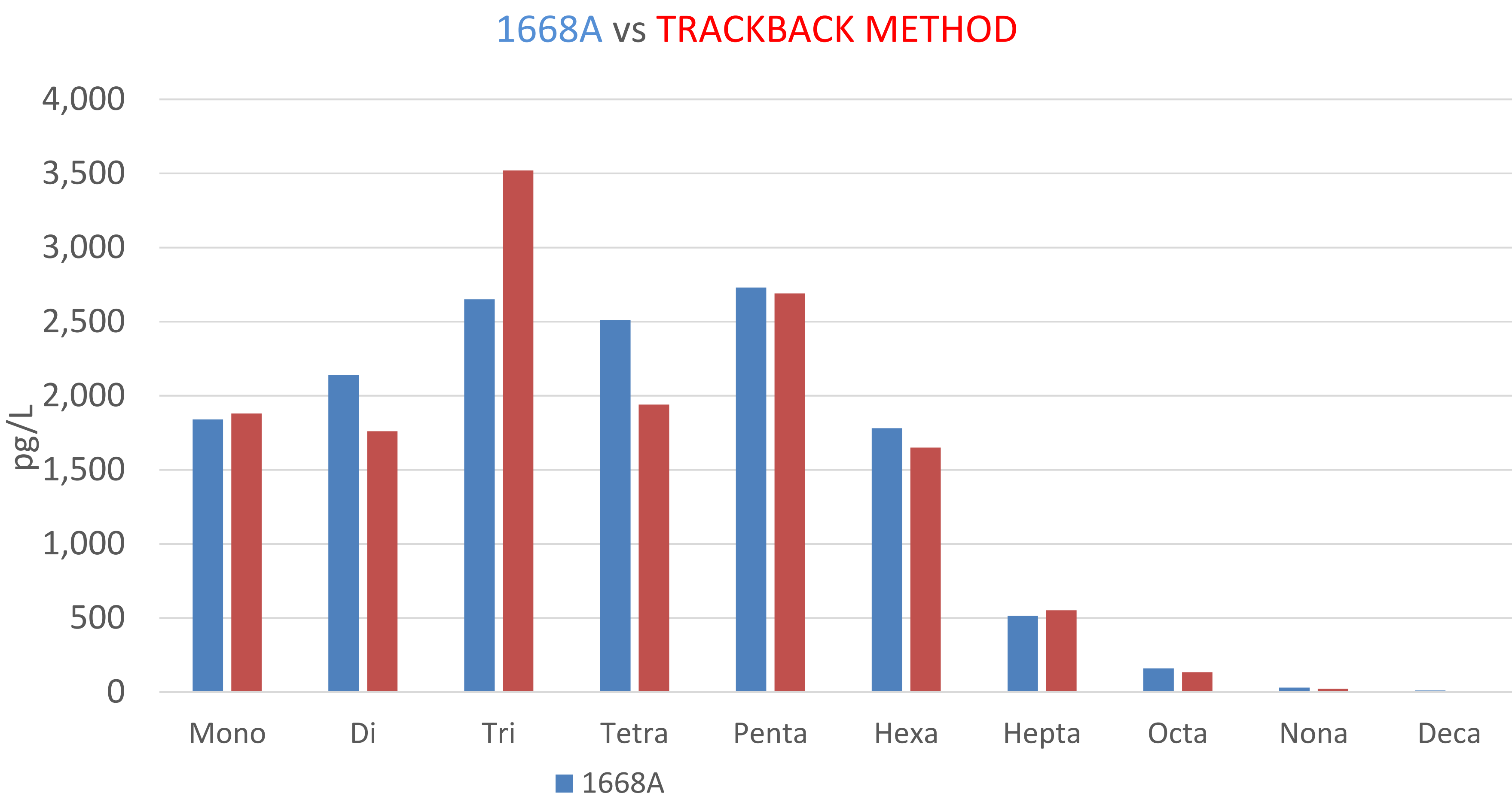
Selecting Sufficiently Sensitive Method

- Understand your existing data
  - What samples have been collected and where (maps help)
  - Summarize analytical results and identify methods used
  - Use data to identify potential sources
  - Select appropriate method for additional trackback efforts to meet Data Quality Objectives (DQOs)

Other Analytical Trackdown Methods

Method	Advantages	Disadvantages
608 *(GC/ECD)*	None, but cheap	High detection limits (ppb) (uses unweathered commercial Aroclor mixtures as standards, does not detect congeners)
8082a *(GC/ECD)*	Identifies Aroclors and 19 selected congeners	Limited results for congeners, high detection limits (ppb)
680 *(HRGC/LRMS)*	Reports homologs and all 209 congeners (can detect weathered congeners)	Detection limits (sub-ppb) but depending on expected concentrations may yield ND results
Trackback (HRGC/HRMS) *Similar to 1668A*	Reports homologs by summing congeners	Detection limits similar to 1668A

Comparison of Results
(from the same water sample)



Analytical results provided by Pace Labs

Effective Sediment Control

- Historical Foundry Site
  - Manufactured iron pipe from recycled and new material
  - Stored scrap metal on-site
  - Legacy site >100 years old
  - Storm water effluent contaminated with PCBs

Foundry Stormwater Outfall

Year	PMP Initiatives	Analytical Results
2007	Existing sedimentation basin no treatment	118,923 pg/L
2008	Sediment removed from basin and filtration system added	847 pg/L
2009	Filtration system failed and demolition of facility began	47,651 pg/L
2010	Demolition continues increasing sediment load	94,821 pg/L
2011	Demolition completed and rerouting of additional stormwater to sedimentation basin. Increased sediment trapping in stormwater drains	35,086 pg/L
2012	Filtration system under repair (during sample collection). Identification of remaining potential sources	33,434 pg/L
2013	Filtration system repairs completed. Continued system Maintence. Begin re-grading and seeding to reduce runoff	1,519 pg/L

Effective Trackback Strategies
Municipal Facility

- Permitted capacity 134 mgd (CSO system)
- Average dry weather flow ~80 mgd
  - ~10 mgd from City of Wilmington
  - ~70 mgd from New Castle County
- Total sewershed 2,150 sq. miles
- 200 miles of sewer lines most >90% combined
- 500,000 people served

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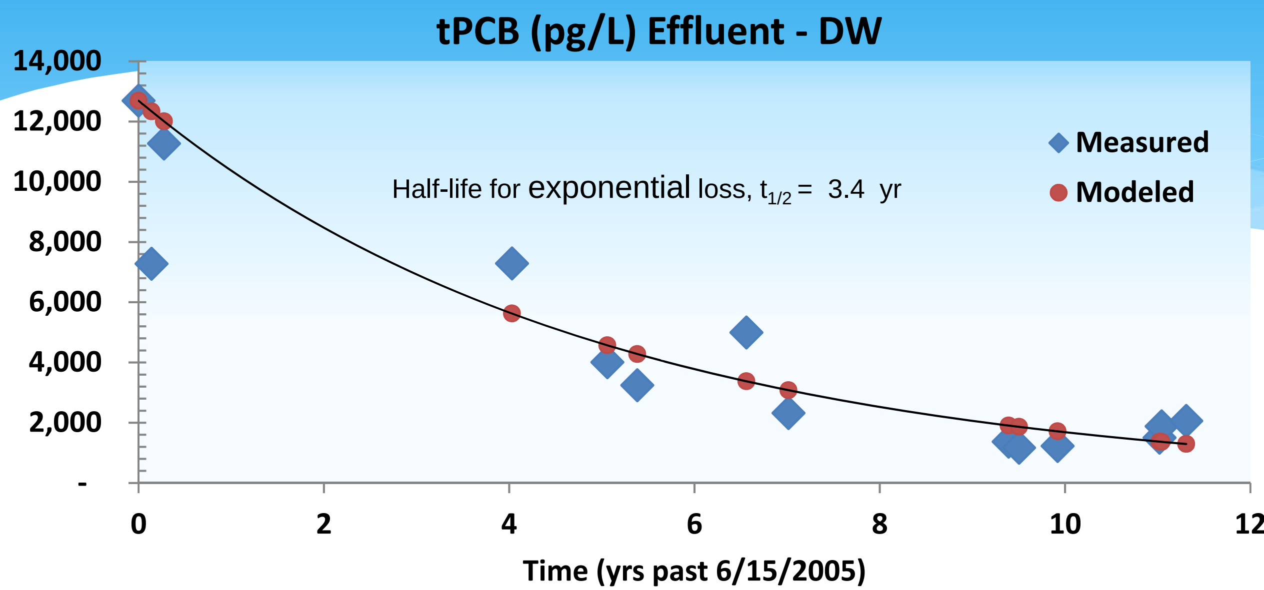
Ongoing Solids Removal Program from Interceptors

Year	Tons	lbs	lbs PCB removal*
2006	1,676	3,352,000	1.676
2010	374	748,000	0.374
2011	138	276,000	0.138
2012	463	926,000	0.463
2015	150	300,000	0.15
Total	2,801	5,602,000	2.801

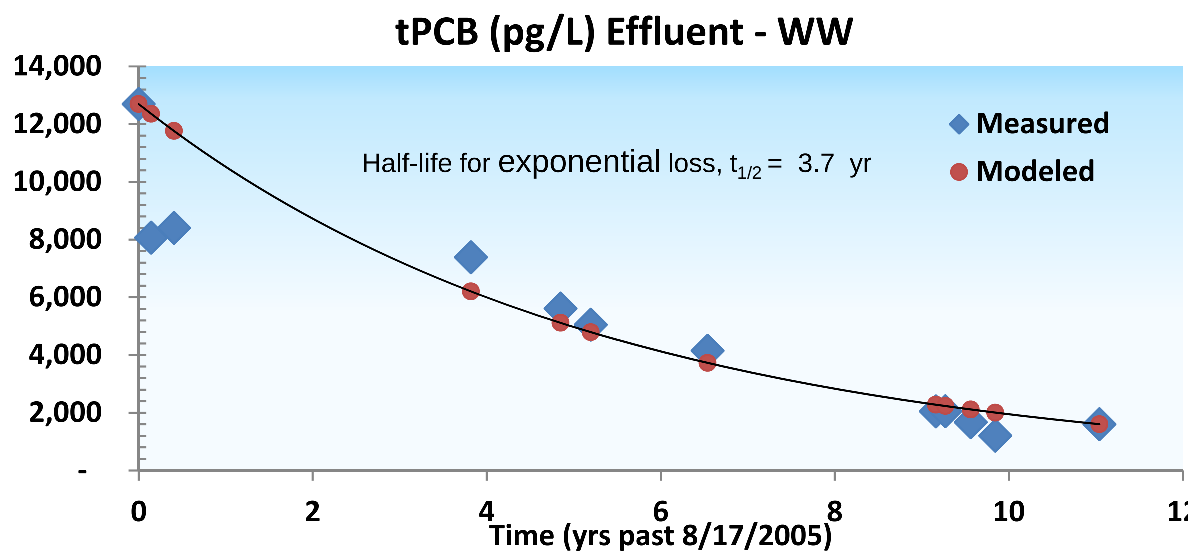
*Assuming 1 ppm tPCB (50% moisture)

City of Wilmington
PCB Loadings Reductions 2005-2016 (81%)



Graphs courtesy of Dr. R. Greene, 2017

Delaware Department of Natural Resources and Environmental Control, Dover DE.



Trackdown Study Design

- Define objectives and methods
  - Identify loadings by geographical area (concentration x flow)
  - Select sampling conditions (dry or wet weather)
  - Chose sampling method (grab or composite 24hrs)
  - Select analytical methods (1668A, 680, 8082A, other)
  - Other parameters
- Identify sampling drainage areas and associated pump stations
  - Coverage should include all influent flows to the WWTP
    - Include a pair influent and effluent sample to the WWTP
- Coordinate activities (New Castle County)
- Have a plan to manage the data

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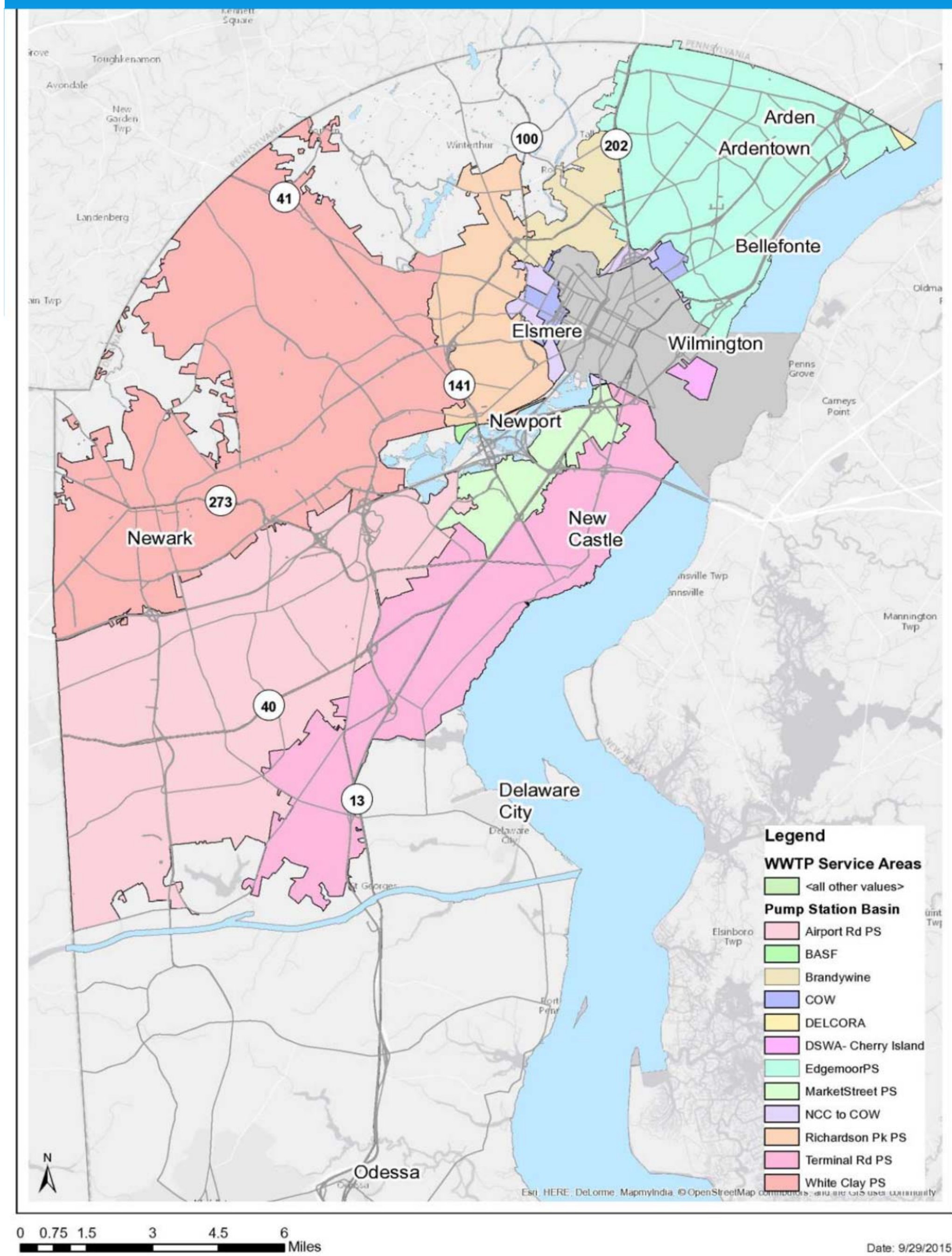

Watershed Map

Sampling Location	City of Wilmington	NCC
WWTP Influent	x	
WWTP Effluent	x	
11th Street P.S.	x	
12 Street P.S.	x	
DSWA	x	
Edgemoor P.S.		x
Terminal Ave. P.S.		x
Airport Rd. P.S.		x
Richardson Park P.S.		x
White Clay P.S.		x
S. Marker Street P.S.		x
Brandywine Park P.S.		x
BASF		x

Results May 2015 Dry Weather Sampling

		5/17/2015 - DW		
Sample Location	**Service Area**	**Flow (MGD)**	**Total PCB (pg/L)**	**PCB Load (g/d)**
A.Pump Stations				
South Market Street P.S.	NCC	0.96	34,300	0.12
Terminal Avenue P.S.	NCC	4.60	14,600	0.25
White Clay P.S.	NCC	15.81	52,800	3.16
Richardson Park P.S.	NCC	3.35	211,000	2.68
Airport Road P.S.	NCC	10.89	2,180	0.09
Edgemoor P.S.	NCC	9.97	51,465	1.94
11th Street P.S.	COW	20.45	120,000	9.30
12th Street P.S.	COW	0.18	18,800	0.01
B.Other Misc.Locations				
Brandywine Meter (enters 11th St. P.S.)*	NCC	-	244,000	-
BASF (goes directly to COW STP)	NCC	0.50	50,200	0.10
DSWA(goes directly to COW STP)	COW	0.21	437,989	0.35
Total		66.92	-	18.02
Total from NCC Service Area		46.07	-	8.35
Total from COW Service Area		20.85	-	9.67
% from NCC Service Area		0.69	-	0.46
% from COW Service Area		0.31	-	0.54
% Brandywine Meter to 11th St. P.S.		-	-	-
WWTP Influent		**66.92**	**-**	**-**
WWTP Outfall		**69.65**	**1,227**	**0.32**

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Results March 2015 Wet Weather Sampling

Sample Location	Service Area	3/11/2015 - WW - .60" Rain Flow (MGD)	Total PCB (pg/L)	PCB Load (g/d)
A. Pump Stations				
South Market Street P.S.	NCC	1.91	10,011	0.07
Terminal Avenue P.S.	NCC	8.49	10,775	0.35
White Clay P.S.	NCC	29.21	49,564	5.49
Richardson Park P.S.	NCC	5.65	105,461	2.26
Airport Road P.S.	NCC	16.66	8,302	0.52
Edgemoor P.S.	NCC	30.10	2,156	0.25
11th Street P.S.	COW	50.70	28,968	5.57
12th Street P.S.	COW	0.14	74,103	0.04
B. Other Misc. Locations				
Brandywine Meter (enters 11th St. P.S.)*	NCC	-	70,478	-
BASF (goes directly to COW STP)	NCC	0.70	112,823	0.30
DSWA(goes directly to COW STP)	COW	0.28	357,095	0.38
Total		143.84	-	15.22
Total from NCC Service Area		92.72	-	9.23
Total from COW Service Area		51.12	-	5.99
% from NCC Service Area		0.64	-	0.61
% from COW Service Area		0.36	-	0.39
% Brandywine Meter to 11th St. P.S.		-	-	-
WWTP Influent		**143.84**	**14,556**	**7.94**
WWTP Outfall		**141.38**	**1,671**	**0.90**

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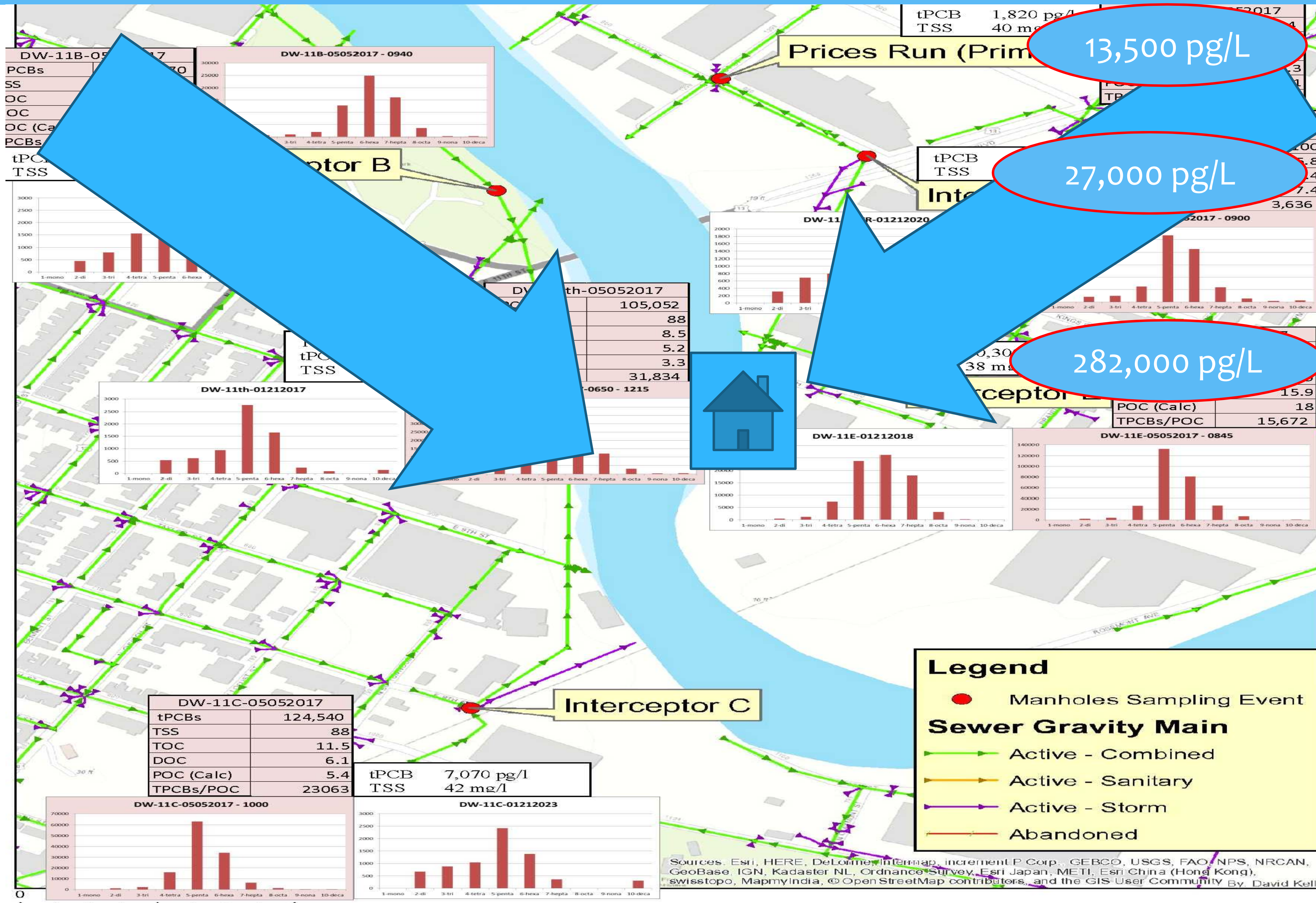
11 St. Pump Station Trackdown

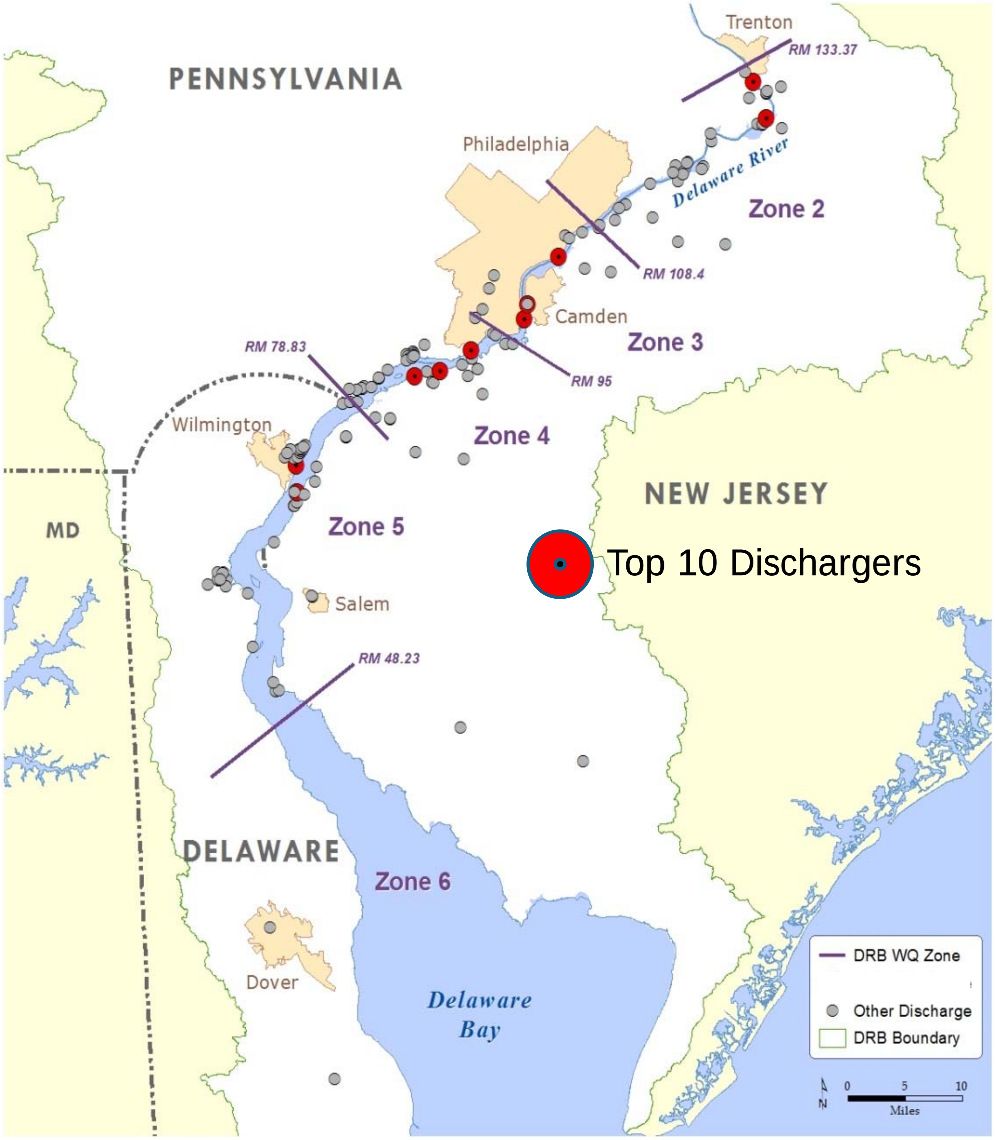


Commission's Responsibility in the PCB TMDL

- Commission maintains PCB database for three states
  - provides template for submission and datachecker
  - Coordinates with States, dischargers, consultants and laboratories.
- Provides technical review of the annual PMP reports to discharges and state representatives.
  - Reviews data and interpretation and offers suggestion for future trackdown efforts
  - PMPs reviewed by Commission Staff in 2017

State	PMPs reviewed by Facility
Delaware	13
New Jersey	39
Pennsylvania	29
Total	81

Point Source Monitoring



Since 2005 monitoring using 1668A was required of all dischargers using a standardized approach.

Monitoring was initially required by the Commission in 2005 and subsequently incorporated in NPDES permits upon reissuance.

PMP development was required either through NPDES permits or directly through Commission regulations beginning in 2005

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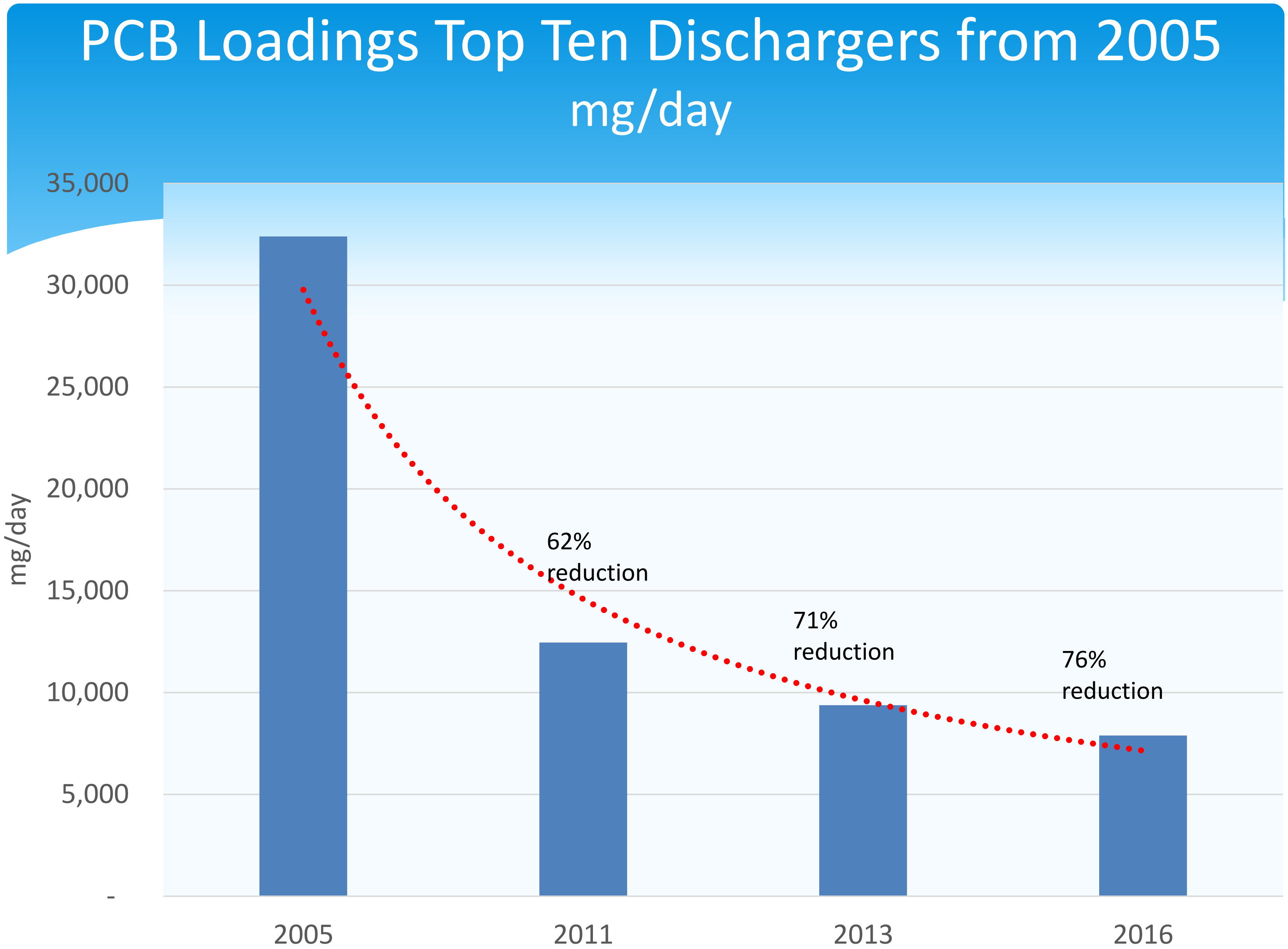
Top Ten PCB Point Source Loading Revisited

Top 90% of all P.S. Loadings (2005)	Loadings mg/day (2005)	Percent Reduction 2005-2016
Valero Refining	11,047	91%
U.S. Steel	7,008	85%
PWD-NE	4,049	73%
PWD-SW	3,141	32%
City of Wilmington	2,723	81%
PWD-SE	1,431	54%
Dupont-ChamberWorks	945	44%
CCMUA	921	68%
Trenton	664	24%
Dupont-Repauno	463	61%
Total	32,391	76%



PCB Loadings Top Ten Dischargers from 2005
mg/day
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
mg/day
62% reduction
71% reduction
76% reduction
2005
2011
2013
2016

Conclusions

- The Implementation of the PCB TMDLs in the Delaware Estuary and Bay has achieved remarkable success, but more needs to be done.   Essential elements include:
  - Requiring consistent monitoring (Method 1668A) and reporting methodologies and a centralized database management system to track reductions
  - Continued implementation of PMPs which provide a framework for evaluating PCB loadings and subsequent reductions by:
    - Identifying and removing active sources
    - Trackdown of legacy contamination and implementation of remedial measures
  - Review of annual reports and providing feedback to dischargers thereby fostering a environment of collaboration.

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Questions?

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Exhibit E

TOTAL MAXIMUM DAILY LOADS FOR POLYCHLORINATED BIPHENYLS (PCBs) FOR ZONES 2 - 5 OF THE TIDAL DELAWARE RIVER

Delaware River Basin Commission
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UNITED STATES OF AMERICA

DELAWARE RIVER BASIN COMMISSION
WEST TRENTON, NEW JERSEY

December 2003

Acknowledgements

This report was prepared by the Delaware River Basin Commission staff: Carol R. Collier, Executive Director. Dr. Thomas J. Fikslin and Dr. Namsoo Suk were the principal authors of the report. Dr. Fikslin is the Head of the Commission's Modeling & Monitoring Branch. Dr. Suk is a Water Resources Engineer/Modeler in the Modeling & Monitoring Branch. Significant technical contributions were made by Gregory J. Cavallo, Dr. Daniel S. L. Liao, Dr. Ronald A. MacGillivray, and John R. Yagecic. Richard W. Greene is gratefully acknowledged for his efforts in summarizing fish tissue data for PCBs, and for providing Figures 2 and 3 of the report. Technical recommendations were provided by the Commission's Toxic Advisory Committee and its TMDL Policies and Procedures Subcommittee.

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EXECUTIVE SUMMARY

Introduction

On behalf of the states of Delaware, New Jersey and Pennsylvania, and in cooperation with the Delaware River Basin Commission, the United States Environmental Protection Agency Regions II and III (EPA) establish these total maximum daily loads (TMDLs) for polychlorinated biphenyls (PCBs) in the Delaware River Estuary. EPA establishes these TMDLs in order to achieve and maintain the applicable water quality criteria for PCBs designed to protect human health from the carcinogenic effects of eating the contaminated fish now found in the Delaware Estuary. In accordance with Section 303(d) of the Clean Water Act (CWA) and its implementing regulations, these TMDLs provide allocations to point sources (WLAs) discharging PCBs as well as allocations to nonpoint sources (LAs) of PCBs, and an explicit margin of safety to account for uncertainties. This TMDL report and its appendices set forth the basis for these TMDLs and allocations and discusses follow up strategies that will be necessary to achieve these substantial reductions of PCBs. EPA will continue to work with the Commission and the States to develop enhanced Stage 2 PCB TMDLs based on information to be collected and analyzed over the next several years. While EPA acknowledges that implementation of these TMDLs will be difficult and may take decades to fully achieve, the establishment of these TMDLs sets forth a framework and specific goals to protect human health and restore the Delaware River from the effects of PCB pollution.

Background

The states of Delaware, New Jersey and Pennsylvania have identified the Delaware Estuary as impaired on their respective lists pursuant to Section 303(d) of the CWA. The States identified the impairments based on their findings of elevated levels of polychlorinated biphenyls (PCBs) in the tissue of fish caught in this portion of the Delaware River. The listing was based upon failure to attain one of the estuary's primary designated uses – fishable waters and the inherent protection of human health from consumption of unsafe fish. When water quality standards, including a numeric criterion and a designated use, are not attained despite the technology-based control of industrial and municipal wastewater (point sources), the Clean Water Act requires that the impaired water be identified on the state's Section 303(d) list of impaired waters and that a total maximum daily load (TMDL) be developed. A TMDL expresses the maximum amount of a pollutant that a water body can receive and still attain standards. Once the load is calculated, it is allocated to all sources in the watershed – point and nonpoint – which then must reduce loads to the allocated levels in order to achieve and maintain the applicable water quality standards.

For management purposes, the Delaware River Estuary has been designated by the Delaware River Basin Commission (also referred to in this report as the Commission) as that section of the main stem of the Delaware River and the tidal portions of the tributaries thereto, between the head of Delaware Bay (River Mile 48.2) and the head of the tide at Trenton, New Jersey (River Mile 133.4). The portion of the Delaware where the river meets the sea, the estuary is characterized by varying degrees of salinity and complex water movements affected by river flows, wind and ocean tides. A map of the estuary showing the water quality management zones 2 through 5 that comprise the tidal Delaware River appears on the following page.

In the late 1980s, the states of Delaware, New Jersey and Pennsylvania began issuing fish consumption advisories for portions of the Delaware Estuary due to elevated concentrations of PCBs measured in fish tissue. Today, the states' advisories cover the entire estuary and bay. The advisories range from a no-consumption recommendation for all species taken between the C&D Canal and the Delaware-Pennsylvania border to consumption of no more than one meal per month of striped bass or white perch in Zones 2 through 4. Why the need for such advisories? PCBs are classified as a probable human carcinogen by the U.S. Environmental Protection Agency (EPA). They also have been shown to have an adverse impact on human reproductive and immune systems and may act as an endocrine disruptor.

PCBs are a class of synthetic compounds that were typically manufactured through the progressive chlorination of batches of biphenyl to achieve a target percentage of chlorine by weight. Individual PCB compounds called congeners can have up to 10 chlorine atoms attached to a basic biphenyl structure consisting of two connected rings of six carbon atoms each. There are 209 patterns in which chlorine atoms may be attached, resulting in 209 possible PCB compounds. These compounds can be grouped into "homologs" defined by the number of chlorine atoms attached to the carbon rings. Thus, for example, PCB compounds that contain five chlorine atoms comprise a homolog referred to as pentachlorobiphenyls or penta-PCBs.

Blue Marsh Reservoir
Reading
Pottstown
Green Lane
Lake Galena
Manatawny Cr.
Perkiomen Creek
Neshaminy Creek
Delaware River
Assunpink Cr.
RM 133.4
Trenton
Wissahickon Cr.
Crosswicks Creek
Blacks Creek
Schuylkill River
RM 108.4
Marsh Creek Reservoir
Zone 2
Pennsylvania
Philadelphia
Rancocas Creek
West Br. Brandywine Cr.
Brandywine Creek
Geist
Crum Cr.
Pennsauken Cr.
Camden
Zone 4
RM 95
Zone 3
RM 78.83
White Clay Cr.
Cooper River
Mantua Cr.
Big Timber Cr.
Wilmington
Hoopes Res.
New Jersey
Raccoon Cr.
Oldmans Cr.
Maryland
Christina River
Salem River
Zone 5
Maurice River
Salem
C & D Canal
Cohansey River
Alloway Cr.
Stowe Cr.
Union Lake
RM 48.23
Zone 6
Smyrna River
Delaware
Leipsic River
Dover
Dennis Cr.
N
Delaware Bay
St. Jones River
Murderkill River
0 5 10
Miles
Mispillion River
Cedar Cr.
Milford
RM 0
Atlantic Ocean
Broadkill River
Lewes

Due to their stable properties, PCBs were used in hundreds of industrial and commercial applications, including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products; and in pigments, dyes and carbonless copy paper, among other applications. PCB laden oil is often associated with electrical transformers. More than 1.5 billion pounds of PCBs were manufactured in the United States before their manufacture and general use, with a few small exceptions, was banned by the EPA in the late 1970s. Existing uses in some electrical equipment continue to be allowed. PCBs are hydrophobic and thus tend to bind to organic particles in sediment and soils. Their chemical stability allows them to persist in the environment for years. PCBs accumulate in the tissue of fish and other wildlife, entering the organism through absorption or ingestion. As a result, they may be present in fish and marine mammals at levels many times higher than in the surrounding water and at levels unsuitable for human consumption.

The water quality standards that form the basis for the TMDLs are the current Delaware River Basin Commission water quality criteria for total PCBs for the protection of human health from carcinogenic effects. These criteria were identified as the TMDL targets by a letter dated April 16, 2003 from the Regional Administrators of EPA Regions II and III to the Executive Director of the Delaware River Basin Commission. The criteria are 44.4 picograms per liter in Zones 2 and 3, 44.8 picograms per liter in Zone 4 and the upper portion of Zone 5, and 7.9 picograms per liter in lower Zone 5. The more stringent criterion in the lower estuary reflects a higher fish consumption rate utilized by the Commission and the State of Delaware, based upon an evaluation of fish consumption there. A consequence of the inconsistency in criteria is that a critical location occurs at the point between upper and lower Zone 5 where the criteria drop sharply from 44.8 picograms per liter to 7.9 picograms per liter. Achieving the lower standard in a portion of Zone 5 will require much larger reductions in the upper zones than would otherwise be necessary. Significant reductions are required throughout the estuary in any case, as ambient concentrations of PCBs in the water body currently exceed the criteria by two to three orders of magnitude.

PCBs have been dispersed throughout the environment by human activity. They enter the atmosphere as a gas, spill into soils and waterways, and lodge in sediments. They continue to be generated as a byproduct by some industrial processes. Thus, the sources of PCBs to the Delaware Estuary are multiple. They include loadings from the air, the main stem Delaware River above Trenton, tributaries to the Delaware both above and below Trenton, industrial and municipal point source discharges, combined sewer overflows, and storm water runoff, including runoff from seriously contaminated sites. For purposes of these TMDLs, point sources include all municipal and industrial discharges subject to regulation by the NPDES permit program, including combined sewer overflows and stormwater discharges. All other discharges are considered nonpoint sources.

Interagency and Interstate Cooperation

In the latter half of the 1990s, the three estuary states included the portions of Zones 2 through 5 of the Delaware River within their borders on their lists of impaired waters under Section 303(d) of the Clean Water Act, due to elevated levels of PCBs in estuary fish. This action required the states and EPA to agree upon a schedule for establishing TMDLs for PCBs. In order to provide for a single TMDL adoption process for the shared water body, one date for completion of the TMDLs – December 15, 2003 – was established. This is the date set for completion of the PCB TMDLs by a 1997 Consent Decree and Settlement Agreement in an action entitled *American Littoral Society and Sierra Club v. the United States Environmental Protection Agency et al.*, which established dates for adoption of TMDLs in the Delaware

Estuary. Because a unified legal process for issuance of the TMDLs could not be accomplished easily through independent state actions, at the request of the states, EPA agreed to issue the TMDLs for PCBs in the estuary on the states' behalf.

In the spring of 2000, the states and EPA asked the Delaware River Basin Commission to take the lead in developing the technical basis for the estuary PCB TMDLs. In consultation with its Toxics Advisory Committee (TAC), comprised of representatives from the states, EPA Regions II and III, municipal and industrial dischargers, academia, agriculture, public health, environmental organizations and fish and wildlife interests, the Commission undertook to do so. In September of 2000, the Commission established a panel of scientists expert in the modeling of hydrophobic contaminants such as PCBs to advise it and the TAC on the development of the complex hydrodynamic and water quality model required to develop the TMDLs. The Commission also initiated an extensive program of scientific investigations and data collection efforts. In response to a recommendation of the expert panel, in May of 2002 the Commission engaged a consultant experienced in water quality modeling to work closely with Commission staff to develop the model.

In consultation with the TAC, the Commission staff and the Delaware Estuary Program developed a strategy to address contamination of the Delaware Estuary by PCBs (the PCB Strategy). The PCB Strategy includes the following nine components: (1) determination of the water quality targets for PCBs; (2) characterization of PCB concentrations in the estuary ecosystem; (3) identification and quantification of all point and nonpoint sources and pathways of PCBs; (4) determination of the transport and fate of PCB loads to the estuary; (5) calculation of the TMDLs, including the wasteload and load allocations required for a TMDL;(6) development of an implementation plan to reduce PCBs entering the estuary; (7) initiation of an effort to increase public awareness of toxicity issues in the estuary; (8) long-term monitoring of PCB concentrations in air, water and sediments of the estuary; and (9) long-term monitoring of PCB concentrations in living resources of the estuary and impacts upon living resources of the estuary. The PCB Strategy is one component of EPA's reasonable assurance that the allocations of these TMDLs will ultimately be achieved.

In a cooperative effort, EPA, the Commission, the states, municipal and industrial dischargers and other stakeholders, have now completed the PCB Strategy components necessary for issuance of the TMDLs. This TMDL report discusses the identification of water quality targets for the TMDLs and calculation of the TMDLs in more detail below (components 1 and 5). An extensive program of scientific investigations and data collection efforts to further characterize PCB sources, concentrations and pathways in the estuary ecosystem is ongoing (components 2, 3 and 8). To date, studies have been assembled or undertaken on fish tissue, ambient water quality, sediment, air deposition, air-water exchange, bioaccumulation pathways, tributary loading, point source discharges, and stormwater loadings. The transport and fate of PCBs in the estuary ecosystem (component 4) has been established through the development of a complex mathematical model, also discussed below. The Commission has established a TMDL Implementation Advisory Committee (IAC) to develop strategies over the next two years for reducing PCB loads to the estuary and achieving the TMDLs (component 6). An effort to educate the public about toxicity issues in the estuary (component 7) began with a series of public information sessions in February and March of 2001. In October of 2002, a coalition of municipal and industrial dischargers sponsored a science symposium, at which the various scientific investigators presented their findings to date. A meeting among regulators and stakeholders on the TMDLs and their regulatory implications was held in April, 2003 (see Appendix 1).

EPA with assistance from the Commission and the States held three informational meetings about the proposed TMDLs on September 22, 24 and 25, 2003, and conducted a public hearing on the proposed

TMDLs on October 16, 2003. During the public comment period EPA received numerous written comments in addition to the testimony provided at the public hearing. EPA considered those comments in finalizing these TMDLs and prepared a Response to Comments document that is part of the record of this decision. Ongoing education initiatives regarding these issues continue to be carried out through the Delaware Estuary Program and the Partnership for the Delaware Estuary.

Development of the TMDLs

The three-year schedule for development of the estuary TMDLs by December 15, 2003 resulted in a decision to develop the TMDLs using a staged approach. The Stage 1 and Stage 2 TMDLs will each comply fully with EPA requirements and guidance. The staged approach will provide for adaptive implementation through execution of load reduction strategies while additional monitoring and modeling efforts proceed. As discussed below, these Stage 1 TMDLs are based on the best water quality-related monitoring data, modeling and scientific analysis available at this time. EPA expects that additional monitoring data and modeling results will be collected and developed following issuance of the Stage 1 TMDLs. This additional information will enable a more refined analysis to form the basis of the Stage 2 TMDLs. EPA will continue to work with the Commission and the States to develop and complete the Stage 2 TMDLs. Until the Stage 1 TMDLs are amended or replaced, the Stage 1 TMDLs are the final and effective TMDLs for purposes of the CWA.

EPA's regulations implementing Section 303(d) of the Clean Water Act provide that a TMDL must be expressed as the sum of the individual wasteload allocations (WLA) for point sources plus the load allocation (LA) for nonpoint sources plus a margin of safety (MOS). This definition may be expressed as the equation: TMDL = WLA + LA + MOS. A separate TMDL has been developed for each water quality management zone of the estuary. Each of the TMDLs must provide for achievement of the applicable water quality standards within the zone and also must ensure that water quality in downstream zones is adequately protected.

In June of 2002, the expert panel recommended that for the TMDLs to be completed by December 15, 2003, the Commission should develop and calibrate a water quality model for only one of the PCB homologs and use it to develop a set of TMDLs from which TMDLs for total PCBs could be extrapolated. This process became known as Stage 1 of an iterative approach to establishing the TMDLs for PCBs in the estuary. Since pentachlorobiphenyls were the dominant homolog in fish tissue monitored in the estuary, and since ambient data indicated that throughout the estuary this homolog represents approximately 25 percent of the total PCBs present, the pentachlorobiphenyls (penta-PCBs) were selected. Based on these recommendations and a review of the available data, EPA adopted this approach. Thus, based on the best scientific estimates and analysis as discussed further below, the Stage 1 TMDLs, WLAs and LAs for total PCBs were extrapolated, using a factor of 4 to 1, from TMDLs and allocations developed for penta-PCBs. EPA, the Commission and the States expect that the Stage 2 TMDLs, WLAs and LAs will be based on the summation of the PCB homolog groups, without the use of extrapolation. The partners intend that the Stage 2 TMDLs will be developed using all additional data collected and modeling performed after the establishment of these TMDLs. It is anticipated that the Stage 2 WLAs will be based upon an enhanced allocation methodology. When they are developed and established, the partners expect that the Stage 2 TMDLs will replace the Stage 1 TMDLs.

The TMDLs were calculated using both a conservative chemical model and a penta-PCB water quality model run until equilibrium was observed. This procedure was used because hydrophobic contaminants like PCBs sorb to particulates and interact significantly with the sediments of the estuary. Sediments respond more slowly than the water column to changes in PCB concentrations in either medium, and allowing the water column and sediments to come into equilibrium is necessary to ensure that water quality criteria are met. A modified version of the TOXI5 water quality model was used (DRBC 2003a and 2003b). Both models utilized outputs from a DYNHYD5 hydrodynamic model that was extended from the head of the Delaware Bay to the mouth of the bay (DRBC 2003a). The models cycled inputs from the period February 1, 2002 until January 31, 2003. This one-year period was considered to be representative of long-term hydrological conditions for two important reasons. First, during this period flows of the two main tributaries to the estuary – the main stem Delaware River and the Schuylkill River – reasonably represent the flows during the approximately 90- and 70-year periods of record, respectively, for the two tributaries (see Figures 5 and 6). Precipitation data during the one-year period also is in good agreement with the long-term precipitation record with respect to the number and percentage of days with and without precipitation. Upon the recommendation of the expert panel, in order to maintain hydrological and meteorological relationships between the various inputs to the model, effluent flows were based upon data for the same one-year period, rather than on design flows. The same approach was used for inputs such as air temperature, water temperature and wind speed.

Penta-PCB TMDLs were calculated in a four step procedure. The procedure initially utilized the conservative chemical model to establish contribution factors for two of the major tributaries to the estuary – the Delaware River at Trenton and the Schuylkill River – and each of the four estuary zones. The contribution factor reflects the influence of the loading attributable to each tributary or zone on the PCB concentration at the critical location in Zone 5 where the water quality criterion for PCBs drops from 44.4 picograms per liter to 7.9 picograms per liter. If the criterion at this location is met, then the water quality criteria are met throughout the estuary. Once the contribution factors were established, the TMDLs were calculated over a one-year period to determine an annual median loading. The annual median was used in order to be consistent with the model simulations and the 70-year exposure for human health criteria. A description of the four steps follows:

1. Calculate the contribution factor (CF) for each of the estuary zones and two of the tributary model boundaries to that critical location in Zone 5 where the criterion of 7.9 picograms per liter (approximately 2.0 picograms per liter of penta-PCBs) is controlling.

2. Calculate the allowable loadings from each of these sources that will still ensure that the water quality target is met at the critical location utilizing the CF and the proportion of the assimilative capacity at the critical location allocated to each source. Iteratively determine the amount of assimilative capacity (in picograms per liter) provided by the sediments, and add this concentration to the penta-PCB water quality target. Recalculate the allowable loadings from each of the six sources using this revised water quality target.

3. Utilize the water quality model for penta-PCBs with these allowable loadings to confirm that the sediment concentrations have reached pseudo-steady state, and confirm that the penta-PCB water quality target is met in Zones 2 through 5.

4. Estimate the gas phase concentrations that would be in equilibrium with the penta-PCB water concentrations when the water quality targets are met, include these in the water quality model, and then iteratively adjust the gas phase concentration of penta-PCBs in the air until the water quality target is reached.

For purposes of calculating the TMDLs, EPA notes that the model assumes that PCB loads from the ocean, the C&D Canal, the major tributaries and the air are at levels that ensure that the water quality standards are achieved, rather than at the actual levels, which in every case are higher. Thus, in developing the TMDLs, both the ocean boundary and the C&D Canal boundary were set to an equivalent penta-PCB criterion of 2.0 picograms per liter, corresponding to a total PCB water quality criterion of 7.9 picograms per liter, the criterion in lower Zone 5 where each of these water bodies meets the estuary. Other programs and factors beyond the scope of these TMDLs will be necessary to reduce PCB loads from these sources. The actual concentration at the mouth of the Bay exceeds the water quality criterion by one to two orders of magnitude, while the current concentration at the C&D Canal boundary exceeds this value by almost three orders of magnitude. Similarly, the Schuylkill and Delaware River boundary conditions were set to 9.68 picograms per liter and 10.72 picograms per liter respectively, although the actual concentrations in the two water bodies at the point where they enter the estuary are 1800 and 1600 picograms per liter respectively. The air concentration of PCBs also is considered by the model. When water quality standards are achieved, however, there will be no significant net exchange between dissolved PCBs in water and gas phase PCBs in the air. Because gas phase PCBs do not provide a load to the estuary when the water quality standards are met, they are not allocated any portion of the TMDLs. Actual air concentrations in the estuary region, however, currently exceed the levels required for equilibrium by two orders of magnitude.

The TMDLs for penta-PCBs calculated with the four-step procedure were 64.34 milligrams per day for Zone 2, 4.46 milligrams per day for Zone 3, 14.18 milligrams per day for Zone 4, and 12.02 milligrams per day for Zone 5. The higher TMDLs in Zones 2 and 4 are the result of the assimilative capacity provided by the flows from the main stem Delaware River in Zone 2 and the Schuylkill River in Zone 4.

Each of the zone TMDLs was then apportioned into three components: the WLA, LA and MOS. EPA has based these allocations upon recommendations of the Commission's TAC. The committee recommended that an explicit MOS of 5% be allocated in each estuary zone, and further recommended that for the Stage 1 TMDLs, the proportion of the TMDLs allocated to WLAs and LAs should be based upon the current proportion of loadings from the various PCB source categories to each of the zones during the one-year cycling period of February 1, 2002 to January 31, 2003.

Stage 1 TMDLs were then calculated using the ratio of penta-PCBs to total PCBs observed in ambient water samples collected during five surveys that encompass the range of hydrological conditions typically observed in the estuary. Median penta- to total PCB ratios of 0.23, 0.25, 0.25 and 0.23 were observed in Zones 2 to 5, respectively. For these TMDLs, a fixed value of 0.25 was used for all zones to scale up the zone-specific TMDLs, WLAs, LAs and MOSs. The following table summarizes the TMDLs for each estuary zone for total PCBs as well as the allocations to WLAs, LAs and the MOSs.

Stage 1 TMDLs for Total PCBs

Estuary Zone	TMDL	WLA	LA	MOS
	mg/day	mg/day	mg/day	mg/day
Zone 2	257.36	11.03	233.46	12.87
Zone 3	17.82	5.67	11.26	0.89
Zone 4	56.71	6.54	47.34	2.84
Zone 5	48.06	15.62	30.04	2.40
Sum	379.96	38.86	322.10	19.00

In the proposed PCB TMDLs, the LAs contained the loadings from municipal separate storm sewer systems (MS4s), which are regulated as NPDES point sources. Loadings from MS4s are now identified and included as part of the WLAs with the LAs adjusted accordingly.

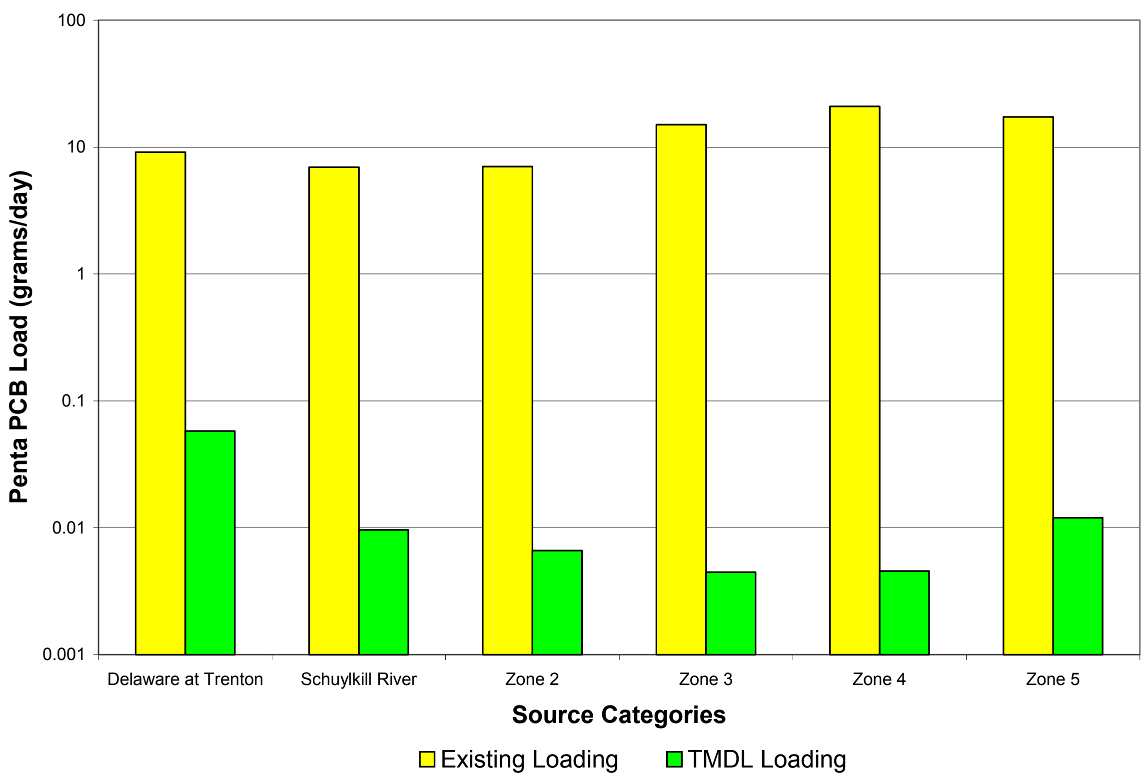
The portion of the TMDLs allocated to non-point sources is higher than the portion of the TMDLs allocated to point sources in all four estuary zones when the current loading proportions are used as the basis for allocating the zone TMDLs. This result is not unexpected. Nonpoint sources include, among other sources, contaminated sites, non-point source runoff, and the two main tributaries, which contribute greater loadings to the zones than the NPDES discharges (including stormwater discharges and combined sewer overflows) that comprise the point source contributions. The proportions vary between zones, with Zones 3 and 5 having the highest allocations to point sources (approximately 30%).

Implementing Load Reductions to Achieve the TMDLs

The following figure compares the current penta-PCB loadings for water quality management Zones 2 through 5 and the Delaware and Schuylkill Rivers to the Stage 1 TMDL penta-PCB loadings:

The chart illustrates that existing loadings are roughly two to three orders of magnitude higher than the TMDLs. Achieving the water quality standards for PCBs in the Delaware Estuary will require significant reductions from current loadings from both point and nonpoint sources. In addition to reducing PCB loads from sources discharging directly to the estuary, reductions from sources in the non-tidal portion of the river, local and regional air emissions, and sources contributing to elevated PCB concentrations in the Atlantic Ocean will be necessary to achieve and maintain the applicable PCB standards and adequately protect human health.

These TMDLs focus on the instream conditions which need to be met to protect human health and establish individual wasteload allocations (WLAs) for 142 point sources that are deemed to be potential sources of penta-PCBs (see Appendix 2). In order to begin to implement these TMDLs, the NPDES permitting authorities believe that it is appropriate for these discharges to receive non-numeric water quality-based effluent limits (WQBELs) consistent with their



respective individual WLAs when their NPDES permits are reissued or otherwise modified.[1] The Delaware River Basin Commission may also separately require actions to implement these TMDLs. On December 3, 2003, the DRBC passed Resolution 2003-27 authorizing and directing the Executive Director to require dischargers and other responsible parties to conduct monitoring and/or other data collection and analyses to further characterize point and non-point loadings of toxic contaminants, including PCBs, to the Delaware Estuary for purposes of developing and implementing TMDLs or actions under the DRBC Water Quality Regulations. Requirements in NPDES permits or through DRBC regulations may include: (1) the use of Method 1668A, a highly sensitive analytical method capable of detecting very small amounts of PCBs, for any monitoring of influent and effluent to better quantify individual PCB congeners; (2) the development of a PCB minimization plan; and (3) implementation of appropriate PCB minimization measures identified through PCB minimization planning. The respective NPDES permitting authorities will determine the discharge-specific effluent controls consistent with the WLAs, and may consider the following factors: the relative loading of penta-PCBs, the type of discharge, the type of analytical method used to measure the 19 penta-PCB congeners, the number of the penta-PCB congeners that were detected, and the proportion of the zone WLA that is represented by the discharge loading. When Stage 2 TMDLs are issued, it is expected that all NPDES permits issued, reissued or modified will include numeric or non-numeric requirements consistent with the Stage 2 WLAs for each zone. The implementation strategy for the development of NPDES permit effluent limits consistent with the WLAs is discussed at greater length in Appendix 3 of this report.

Reducing point source discharges alone will not be sufficient to achieve the estuary water quality standards. Runoff from contaminated sites is a significant source of PCBs. For these TMDLs, EPA and the states evaluated forty-nine contaminated sites within the estuary watershed (see Appendix 4). The combined loads from these sites are estimated to comprise 57.09% of the loading to Zone 3; 38.04% of the loading to Zone 4 and 46% of the loading to Zone 5 (see Table 7). Contaminated sites make up a much smaller proportion of the loading in Zone 2 – only 0.42% – because of the lack of contaminated sites and the significant influence in this zone of the main stem Delaware River. In order to achieve the reductions required by the TMDLs, EPA and the States would need to undertake a concerted effort using the authorities under CERCLA, RCRA and the related state statutes.

Significant reductions will be required in point and nonpoint sources to the major tributaries. Currently, concentrations of PCBs in the Schuylkill and Delaware Rivers where they discharge to the estuary are approximately 1800 and 1600 picograms per liter, respectively. Even if all the TMDLs are achieved, the water quality criteria in the estuary will not be attained until the

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[1]The States have indicated that a typical permit will include, among other requirements, the requirement to monitor the discharge using Method 1668A and to implement a PCB pollutant minimization program. The regulation at 40 CFR 122.44(k) allows the use of non-numeric, BMP-based WQBELs where a BMP is determined to be an appropriate means to control pollutants under specified circumstances. Where a permit uses such BMP WQBELs, compliance may be achieved by implementing such requirements.

concentration in the Schuylkill is reduced to 9.68 picograms per liter and the concentration in the main stem Delaware River falls to 10.72 picograms per liter.

Although the ocean boundary has a less significant influence on Zone 5 than does the main stem Delaware River, sources contributing to elevated PCB concentrations in the Atlantic Ocean also must be reduced. The concentration of PCBs in ocean water at the estuary boundary currently exceeds the water quality criterion for Delaware Bay by one to two orders of magnitude.

Finally, air concentrations of PCBs in the region currently are two orders of magnitude above the concentration required to achieve equilibrium and halt contributions of PCBs from the air to the water. Air monitoring data collected at several sites in New Jersey, Delaware and Pennsylvania suggest that PCB air concentrations primarily result from local sources. Thus, source reductions must focus on PCBs in the local and regional airshed.

These reductions cannot be achieved overnight. The Commission has created a TMDL Implementation Advisory Committee (IAC), with members from each of the estuary states, the major municipal dischargers and two of the smaller ones, industrial dischargers, and fishery, wildlife and environmental organizations. EPA Regions II and III also will participate, in an advisory role. The IAC will meet over a two-year period to develop creative and cost-effective strategies for achieving load reductions in the short term and attaining water quality standards in the longer term. Notably, some large dischargers already have undertaken studies to track down PCBs on a voluntary basis. However, due to the scope and complexity of the problem that has been defined through development of these TMDLs, achieving the estuary water quality standards for PCBs will take decades.

Additional Information

A notice about the proposed TMDLs for PCBs in the Delaware Estuary was published in the *Federal Register* and in each of the estuary states' registers on September 2, 2003. Additional notices were published in regional newspapers. The notices contained details about the comment period which closed on October 21, 2003, informational meetings and the public hearing for these TMDLs. Details about these events were also provided on the Commission's web site, at http://www.drbc.net. EPA received oral testimony from 8 groups or individuals and written comments from 30 groups or individuals from various sectors. After consideration of all data and information contained in the public comments, a document providing responses to these public comments has been prepared and appropriate revisions made to these final TMDLs.

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1. INTRODUCTION

1.1 Regulatory Background

Total Maximum Daily Loads or TMDLs are one of the approaches defined in the Clean Water Act (CWA) for addressing water pollution. The first approach of the CWA that was implemented by the U.S. EPA was the technology-based approach to controlling pollutants (Section 301). This approach was implemented in the mid-1970s through the issuance of permits authorized under Section 402 of the Act. The approach specified minimum levels of treatment for sanitary sewage and for various categories of industries. The other water quality-based approach was implemented in the 1980s. This approach includes water quality-based permitting and planning to ensure that standards of water quality established by States are achieved and maintained.

Section 303(d) of the Act establishes TMDLs as one of the tools to address those situations where the technology-based controls are not sufficient to meet applicable water quality standards for a water body (U.S. EPA, 1991). They are defined as the maximum amount of a pollutant that can be assimilated by a water body without causing the applicable water quality standard to be exceeded. The basis of a TMDLs is thus the water quality standard. This standard may be established for the protection of aquatic life, human health through ingestion of drinking water or resident fish, or wildlife. Under Section 303(d), States are required to identify, establish a priority ranking, and to develop TMDLs for those waters that do not achieve or are not expected to achieve water quality standards approved by the U.S. EPA. Federal regulations implementing Section 303(d) of the Clean Water Act provide that a TMDL must be expressed as the sum of the individual wasteload allocations for point sources (WLA) plus the load allocation for nonpoint sources (LA) plus a margin of safety (MOS). This definition may be expressed as the equation:

$$TMDL = WLA + LA + MOS$$

1.2 Study Area

Zones 2 through 5 of the Delaware River (Figure 1) have been designated by the Delaware River Basin Commission as that section of the mainstem of the Delaware River and the tidal portions of the tributaries thereto, between the head of Delaware Bay (River Mile 48.2) and the head of the tide at Trenton, New Jersey (River Mile 133.4). Zones 2 to 4 are bordered by the State of New Jersey and the Commonwealth of Pennsylvania. Zone 5 is bordered by the States of Delaware and New Jersey. Zone 2 encompasses the area from the head of the tide at Trenton to River Mile 108.4. Zone 3 encompasses the area from River Mile 108.4 to River Mile 95.0. Zone 4 encompasses the area from River Mile 95.0 to River Mile78.8, and Zone 5 encompasses the area from River Mile 78.8 to the head of Delaware Bay.

In 1989, the Delaware River Basin Commission created the Estuary Toxics Management Program to address the impact of toxic pollutants in the tidal Delaware River (also called the Delaware Estuary. The mission of this program was to develop policies and procedures to control the discharge of substances toxic to humans and aquatic biota from point sources discharging to this water body. In 1993, Commission staff identified several classes of pollutants and specific chemicals that were likely to exceed water quality criteria currently being developed under the program. These included polychlorinated biphenyls (PCBs), volatile organics, metals, chlorinated pesticides, chronic toxicity and acute toxicity. This list was subsequently included in the Delaware Estuary Programs's Comprehensive Conservation and Management Plan in 1996.

Beginning in the late 1980's, concern regarding the possible contamination of fish populations that were rebounding as dissolved oxygen levels improved resulted in a number of investigations of contaminant levels in resident and anadromous fish species. These species included the white perch, channel catfish and striped bass. The studies subsequently identified PCBs and several chlorinated organics at elevated levels (DRBC, 1988; Greene and Miller, 1994; Hauge et al, 1990; U.S. F&WS, 1991 and 1992). These studies and other data collected by DRBC and the states resulted in fish consumption advisories being issued by all three states bordering the Estuary beginning in 1989. These advisories were principally based upon PCB contamination; and to a lesser degree, chlorinated pesticides such as DDT and its metabolites DDE and DDD, and chlordane.

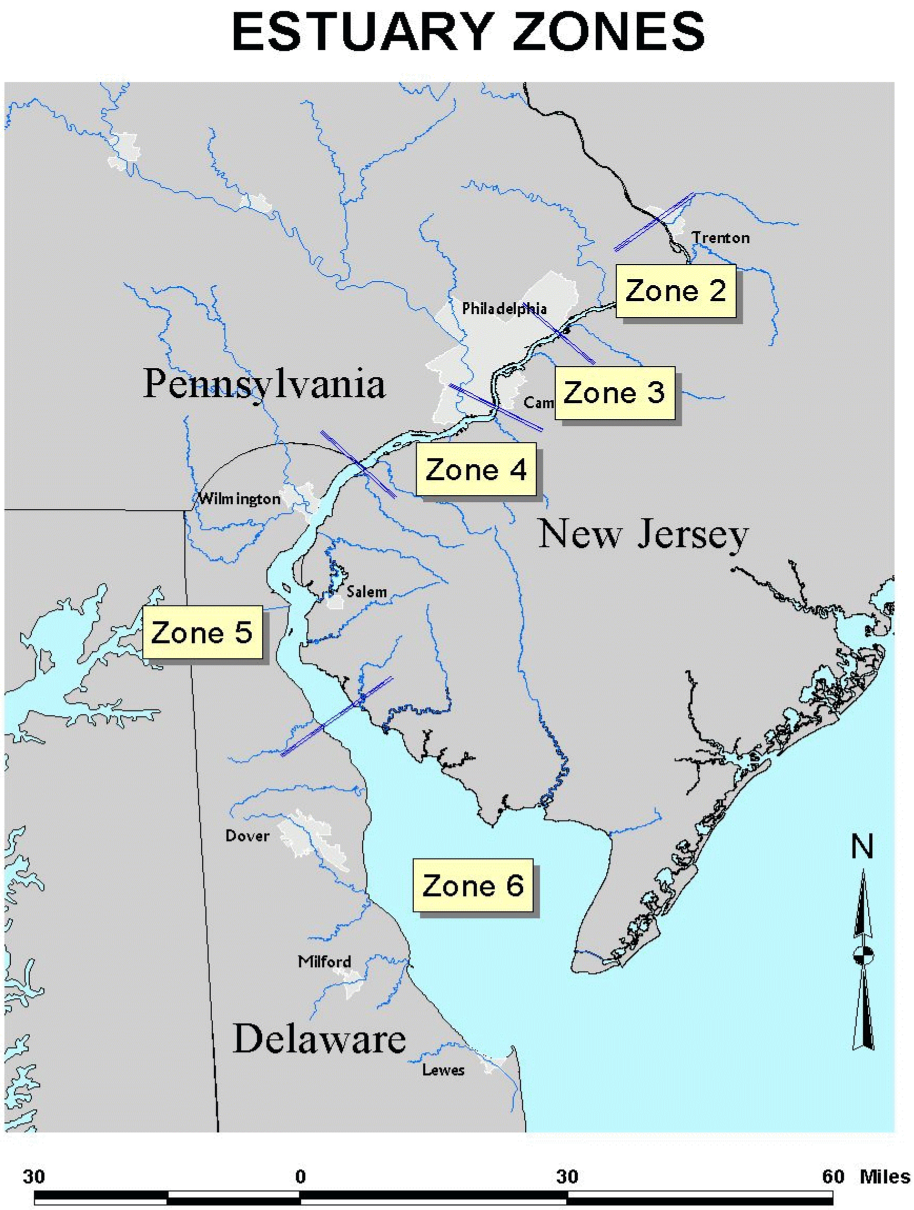
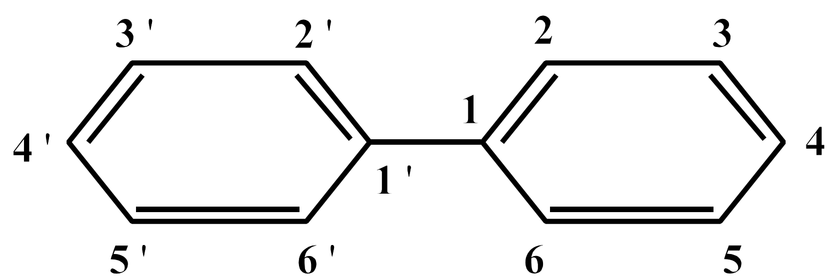


Figure1: Water Quality Zones of the Delaware River.

1.3 Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are a class of man-made compounds that were manufactured and used extensively in electrical equipment such as transformers and capacitors, paints, printing inks, pesticides, hydraulic fluids and lubricants. Individual PCB compounds called congeners can have up to 10 chlorine atoms on a basic structure consisting of two connected rings of carbon atoms. There are 209 possible patterns where chlorine atoms can occur resulting in 209 possible PCB compounds. PCB compounds can be grouped by the number of chlorine atoms attached to the carbon rings. These groups are called homologs. PCB compounds containing five chlorine atoms, for example, are referred to as the pentachlorobiphenyls or penta-PCBs.



Although their manufacture and use were generally banned by federal regulations in the late 1970s, existing uses in electrical equipment and certain exceptions to the ban were allowed. In addition, PCBs may also be created as a by-product in certain manufacturing processes such as dye and pigment production. PCBs are hydrophobic, sorbing to organic particles such as soils and sediments and concentrating in the tissues of aquatic biota either directly or indirectly through the food chain.

1.4 Applicable Water Quality Standards and Numerical Target for TMDLs

Water quality criteria for toxic pollutants including Total PCBs were adopted on October 23, 1996 by the Commission and are included in Section 3.30 of Article 3 of the Commission's water quality regulations. The criteria do, however, differ between the zones of the estuary depending on the designated uses of the zone. In Zones 2 and 3, use of the water for public water supply after reasonable treatment is a designated use. In these two zones, human health criteria are based upon exposure to PCBs through ingestion of water and fish taken from these estuary zones. In Zone 4 and upper Zone 5 (above River Mile 68.75), use of the water for public water supply is not a designated use. In these two zones, human health criteria are based solely upon exposure to PCBs through ingestion of fish taken from these estuary zones. Current DRBC criteria assume a consumption rate of 6.5 grams per day (~½ pound meal every 35 days) is used in Zones 2, 3, 4, and the upper portion of Zone 5. This rate was the default national rate for freshwater fish consumption utilized in EPA's 1980 methodology for deriving human health criteria, and was used by the States in developing their freshwater water quality criteria. A consumption rate of 37.0 grams per day (~½ pound meal every 6 days) is used in the lower portion of Zone 5. This consumption rate is consistent with the rate utilized by the State of Delaware following a recent evaluation of available information on consumption rates.

Although criteria to protect aquatic life from acute and chronic effects of PCBs and criteria to protect human health from the carcinogenic and non-carcinogenic of PCBs were adopted, the most stringent standards adopted were based upon protecting human health from the carcinogenic effect of PCBs through ingestion of water and fish taken from these estuary zones (Table 1). The applicable DRBC water quality criteria are therefore:

Table 1: DRBC Water Qaulity Criteria for Zones 2 to 5 of the Delaware Estuary

Estuary Zone	**Exposure Route**	
	Water & Fish Consumption	Fish Consumption Only
Zone 2 & 3	44.4 picograms per liter	
Zone 4 and upper Zone 5		44.8 picograms per liter
Lower Zone 5		7.9 picograms per liter

These criteria are currently the same as criteria adopted by State of New Jersey and the Commonwealth of Pennsylvania. The DRBC criteria for the lower portion of Zone 5 is also the same as the water quality criteria adopted by the State of Delaware; however, a slightly higher and therefore less stringent criteria was adopted for the upper portion of Zone 5.

As part of the effort to establish TMDLs for total PCBs and to update adopted water quality standards based upon new information, the Commission's Toxic Advisory Committee did consider adopting wildlife criteria for total PCBs and revising the human health criteria for carcinogens. The latter was necessitated by two actions by the U.S. Environmental Protection Agency: the updating of the cancer potency factor (i.e., slope factor), one of the key elements used to calculate the criterion, in December 1998 (U.S. EPA, 1998); and the issuance of revised guidance on developing human health water quality criteria in October 2000 (U.S. EPA, 2000). In February 2003, the Toxics Advisory Committee recommended adoption of a revised human health criterion for carcinogens Zones 2 through 5, and that the NJ state-wide water quality criterion for total PCBs for the Delaware Estuary (Zones 2 though 6) for the protection of wildlife be adopted following the impending adoption by the New Jersey Department of Environmental Protection. Refinement of the wildlife criterion based upon site-specific data could then proceed. The Committee also recommended that the Commission consider alternatives to the current risk level of 10^{-6} (another element in the calculation of the human health criterion for carcinogens). On March 19, 2003, the Commission passed a resolution authorizing public participation of the revised human health criteria for carcinogens and directing the Toxics Advisory Committee to initiate development of site-specific wildlife criteria for Zones 2 through 6 of the Delaware River. Since the basis for the TMDLs could be affected by criteria adoption by either the NJDEP or the DRBC, and the TMDLs must be based on the water quality criteria in force when the TMDL is approved, the Commission further directed that the Commission's Executive Director request U.S. Environmental Protection Agency Regions II and II to identify which criteria should be the basis for the TMDLs at this time. In a letter dated April 16, 2003, both U.S. EPA regional offices indicated that the current and applicable DRBC water quality criteria should be the basis for the TMDLs being developed by Commission staff for December 2003.

1.5 Listing under Section 303(d)

Until recently, the attainment of water quality standards for total PCBs could not be measured directly in samples of ambient water so States relied on measurements of contaminants in fish fillet samples collected from the estuary. This is possible since the amount in fish tissue is related to the water concentration by a factor known as the bioaccumulation factor or BAF. This factor accounts for the uptake and concentration of a contaminant in the tissue either directly from the water or through the target species' food chain. Current and historical concentrations of total PCBs in filet samples collected from channel catfish in Zones 2 through 5 and white perch collected in Zones 2 through 6 are shown in Figures 2 and 3. While tissue concentrations have declined since the banning in the late 1970s, current levels in both species are approximately 800 to 1000 parts per billion (ppb), two to three orders of magnitude above the level expected to occur when estuary waters are at the water quality standards for total PCBs.

New Jersey was the first state to issue an advisory recommending no consumption of channel catfish in 1989. This was followed in 1990 by Pennsylvania who recommended no consumption of white perch, channel catfish and American eel caught between Yardley, PA above Trenton to the Pennsylvania/Delaware border.

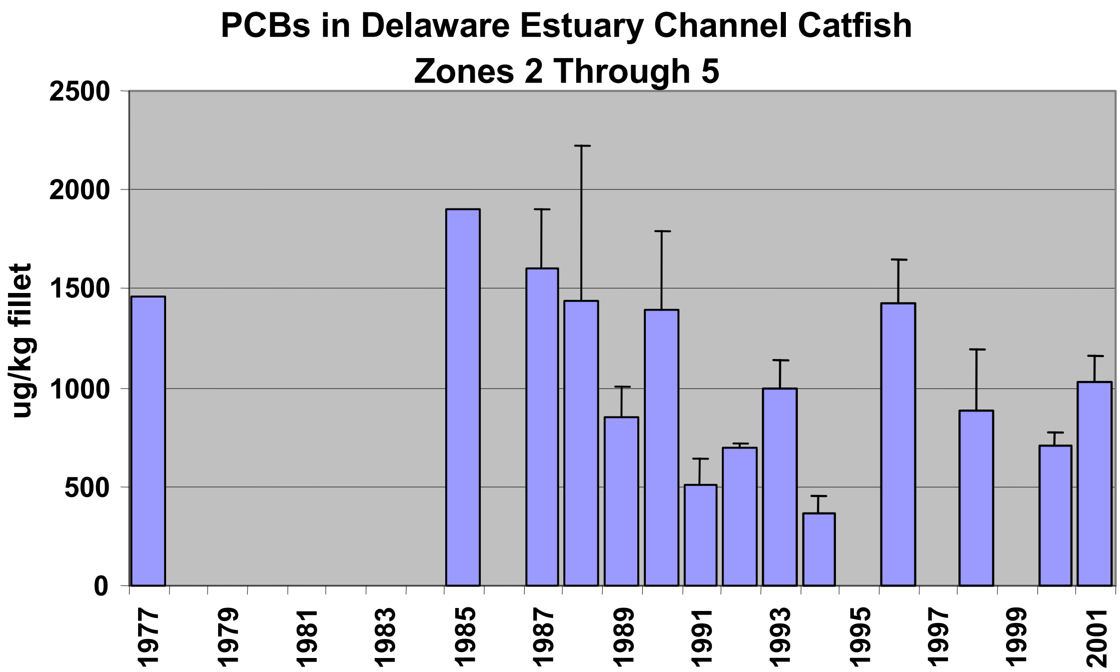


Figure 2: PCB concentrations in fillet samples of channel catfish collected from Zones 2 through 5 of the Delaware Estuary from 1977 to 2001. Units are in micrograms per kilogram or parts per billion (ppb). Graphs provided by Richard Greene, Delaware DNREC.

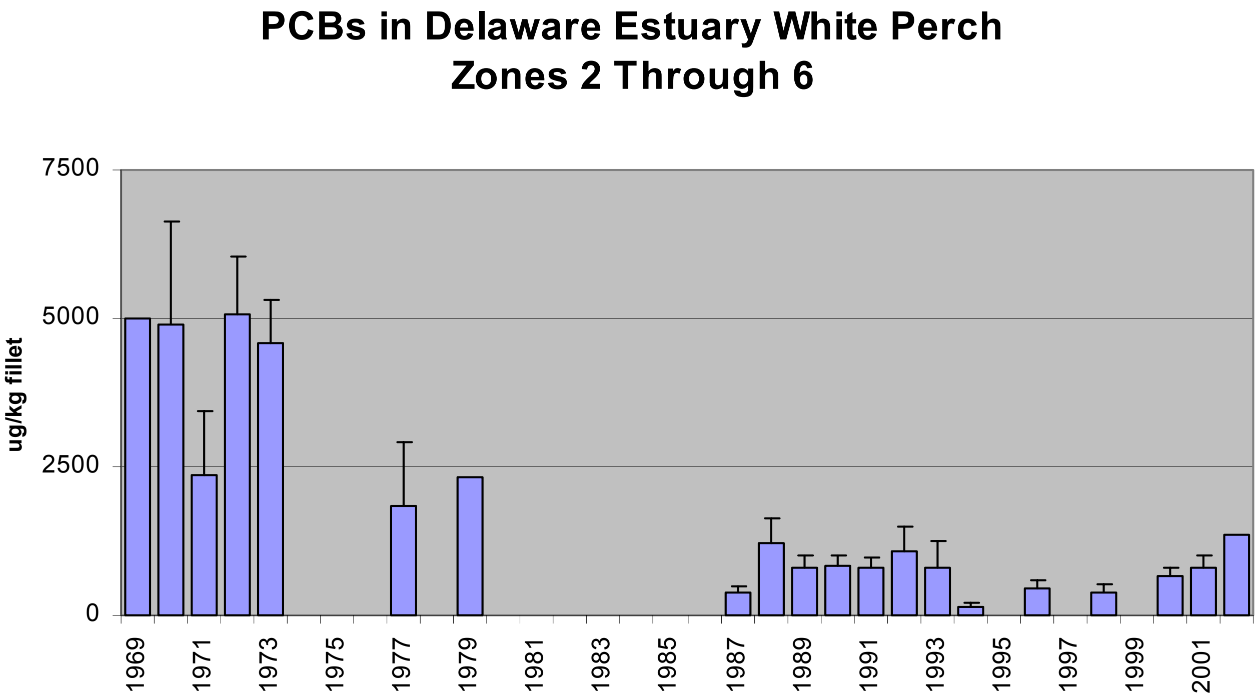


Figure 3: PCB concentrations in fillet samples of white perch collected from Zones 2 through 6 of the Delaware Estuary from 1977 to 2001. Units are in micrograms per kilogram or parts per billion (ppb). Graphs provided by Richard Greene, Delaware DNREC.

After conducting additional sampling in the lower tidal river, Delaware issued an advisory in 1994 recommending no consumption of striped bass, white perch, channel catfish and white catfish caught between the Pennsylvania/Delaware border and the Chesapeake and Delaware Canal (C&D Canal). These advisories remained essentially unchanged until 1999, when Pennsylvania recommended limited consumption (one meal per month) of white perch and striped bass, and one meal every two months for channel catfish in the same advisory area. Delaware meanwhile, increased the restrictions on consuming fish caught between the Pennsylvania/Delaware border and the C&D Canal to all fish species, and reduced the recommended consumption of striped bass, white perch, white catfish, channel catfish and American eel to one meal per year. In January 2003, New Jersey issued updated state-wide and water body-specific advisories due to PCB contamination that included Zones 2 through 5. These advisories contained recommended meal frequencies for two levels of lifetime cancer risk (10^{-5} and 10^{-6}), and for high risk individuals (children, infants, pregnant or nursing women, and women of child-bearing age). Recommended consumption (at a risk level of 10^{-6}) of channel catfish in Zones 2 to 4 is 6 meals per year while no consumption of striped bass in Zone 4 and all finfish in Zone 5 is recommended.

The New Jersey Department of Environmental Protection subsequently included Zones 2 through 5 of the Delaware River for PCBs in a report entitled “1998 Identification and Setting of Priorities for Section 303(d) Water Quality Limited Waters in New Jersey”, September 15, 1998. By Memorandum of Agreement between U.S. Environmental Protection Agency, Region II and the New Jersey Department of Environmental Protection dated May 12, 1999, the NJDEP agreed to develop, public notice, respond to comments and submit to EPA, Total Maximum Daily Loads (TMDLs) for PCBs in the Delaware Estuary by September 15, 2003. This date was subsequently extended to December 31, 2003 in a revised Memorandum of Agreement dated September 16, 2002.

The Delaware Department of Natural Resources & Environmental Control (DNREC) first listed Zone 5 of the Delaware River for toxics in 1996. In 1998, DNREC again listed Zone 5 of the Delaware River, but specifically listed PCBs as a pollutant contributing to the impairment. In Attachment B to a Memorandum of Agreement between the Delaware Department of Natural Resources & Environmental Control and the U.S. Environmental Protection Agency, Region III dated July 25, 1997, DNREC agreed to complete the TMDLs for Zone 5 by December 31, 2002 provided that funding and certain other conditions were met. The MOA also provided that EPA Region III establish the TMDLs if DNREC was unable to complete the TMDLs by the date set forth in Attachment B. In a Consent Decree between the American Littoral Society, the Sierra Club, and the U.S. Environmental Protection Agency dated July 31, 1997, the U.S. EPA agreed to establish TMDLs by December 15, 2003 of the year following the state's deadline.

In a Consent Decree between the American Littoral Society and Public Interest Group of Pennsylvania, dated April 9, 1997, EPA agreed to approve or establish TMDLs for all water quality-limited segments listed on the 1996 303(d) list as impaired by sources other than acid mine drainage by April 9, 2007. PADEP listed Zones 2 to 5 of the Delaware River (included in areas E and G of the Pennsylvania State Water Plan) for priority organics including PCBs in both 1996 and 1998. No date has been set by PADEP for completion of the TMDLs for these water quality segments. The TMDLs currently being proposed will satisfy the commitments that resulted from these listings for each respective state.

1.6 Pollutant sources, loadings and ambient data

The basis for the inclusion of Zones 2 through 5 on the Section 303(d) lists of the estuary states was the levels of PCBs observed in fish tissue collected from the estuary. This was necessary since the common analytical method used for ambient water and wastewater had detection limits for total PCBs in the 500 nanogram per liter range. New Jersey was the first state to issue an advisory recommending no consumption of channel catfish in 1989. This was followed in 1990 by Pennsylvania who recommended no consumption of white perch, channel catfish and American eel caught between Yardley, PA above Trenton to the Pennsylvania/Delaware border. After conducting additional sampling in the lower tidal river, Delaware issued an advisory in 1994 recommending no consumption of striped bass, white perch, channel catfish and white catfish caught between the Pennsylvania/Delaware border and the Chesapeake and Delaware Canal C&D Canal.

Loadings of PCBs to the estuary from point sources were first investigated by the Delaware River Basin Commission in 1996 and 1997 (DRBC, 1998a). This study utilized a new analytical methodology (high resolution gas chromatography/high resolution mass spectrometry or HRGC/HRMS) and focused on discharges from five large sewage treatment plants and one industrial facility. The results of the study found effluent concentrations ranging from 1,430 to 45,140 picograms/L during dry weather, and 2,020 to 20,240 pg/L during wet weather. The dry weather sample from the effluent of the industrial facility had a concentration of 10,270 pg/L. In the spring of 2000, the Commission required 94 NPDES permittees to conduct monitoring of their continuous and stormwater discharges for 81 PCB congeners utilizing analytical methods that could achieve picogram per liter detection limits. The results of this monitoring were submitted to the Commission over the next two years, and indicated that loadings to the estuary zones from point sources were significant and of such magnitude to cause the water quality standards to be exceeded. Figures 4 and 5 present the cumulative loadings of total PCBs from continuous point source discharges during dry weather and wet weather, respectively.

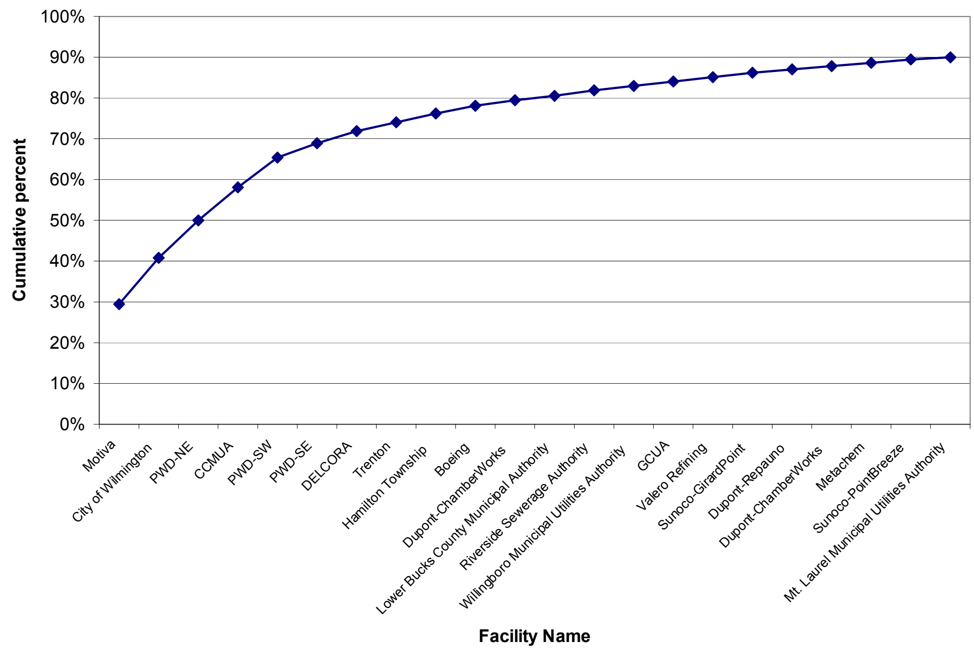


Figure 4: Cumulative loadings from continuous point source dischargers when the discharge was not influenced by precipitation (dry weather loadings).

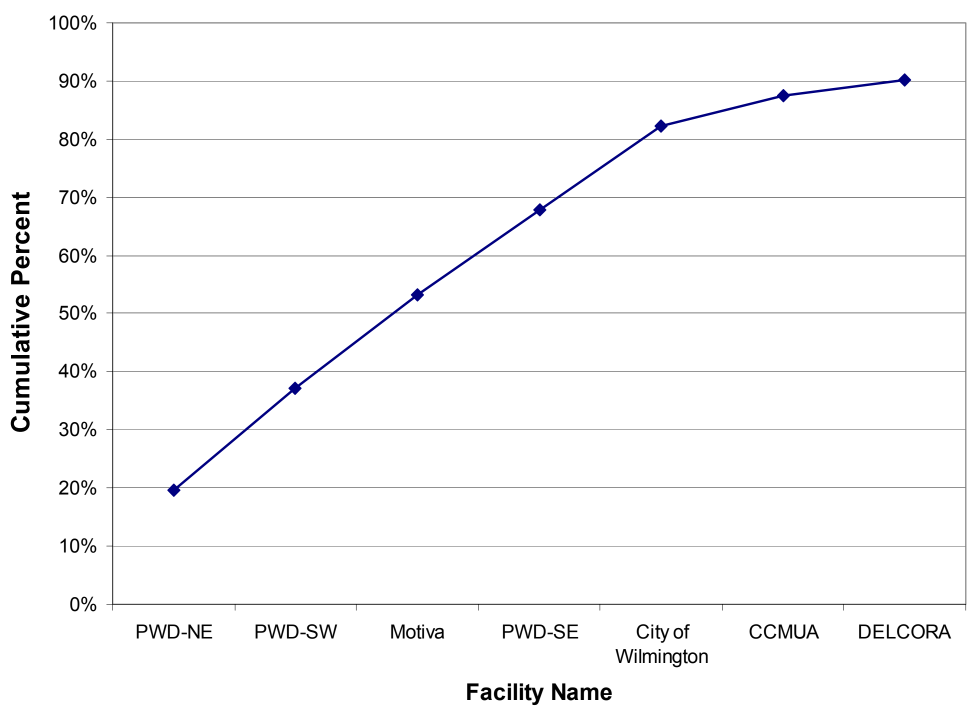


Figure 5: Loadings from continuous point source dischargers when the discharge was influenced by precipitation (wet weather loadings).

Beginning in September 2001, the Commission initiated surveys of the ambient waters of Zones 2 through 5 using the more sensitive HRGC/HRMS method (Method 1668A) and larger sample volumes to obtain data on PCBs adsorbed to particulate matter, PCBs adsorbed to dissolved organic matter and truly dissolved PCBs. Each survey involves sampling on a transect across the river at 15 locations between the C&D Canal and Trenton. A total of nine surveys have been completed to date with a focus on periods of intermediate and high inflows to the estuary. Figure 6 presents the results from surveys conducted in September 2001, May 2002, October 2002 and March 2003. Low flow conditions occurred during the September and October surveys (~3,300 cfs). Intermediate flow conditions (~16,000 cfs) occurred during the May survey, and high flow conditions (36,100 cfs) occurred during the March survey. As indicated in this graph, ambient concentrations of total PCBs based upon the sum of 124 congeners analyzed ranges between 443 and 10,136 pg/L with the highest values generally occurring during lower river inflows.

1.7 Other Required Elements for Establishing TMDLs

1.7.1 Seasonal variation

TMDL regulations at Section 130.32(b)(9) require the consideration of seasonal variation in environmental factors that affect the relationship between pollutant loadings and water quality impacts. Although seasonal variation is usually not as important for TMDLs based upon human health criteria for carcinogens since the duration for this type of criteria is a 70 year exposure, the Stage 1 TMDLs for total PCBs do include seasonal variation in several ways. Due to the interaction of PCBs with the sediments of the estuary, long-term model
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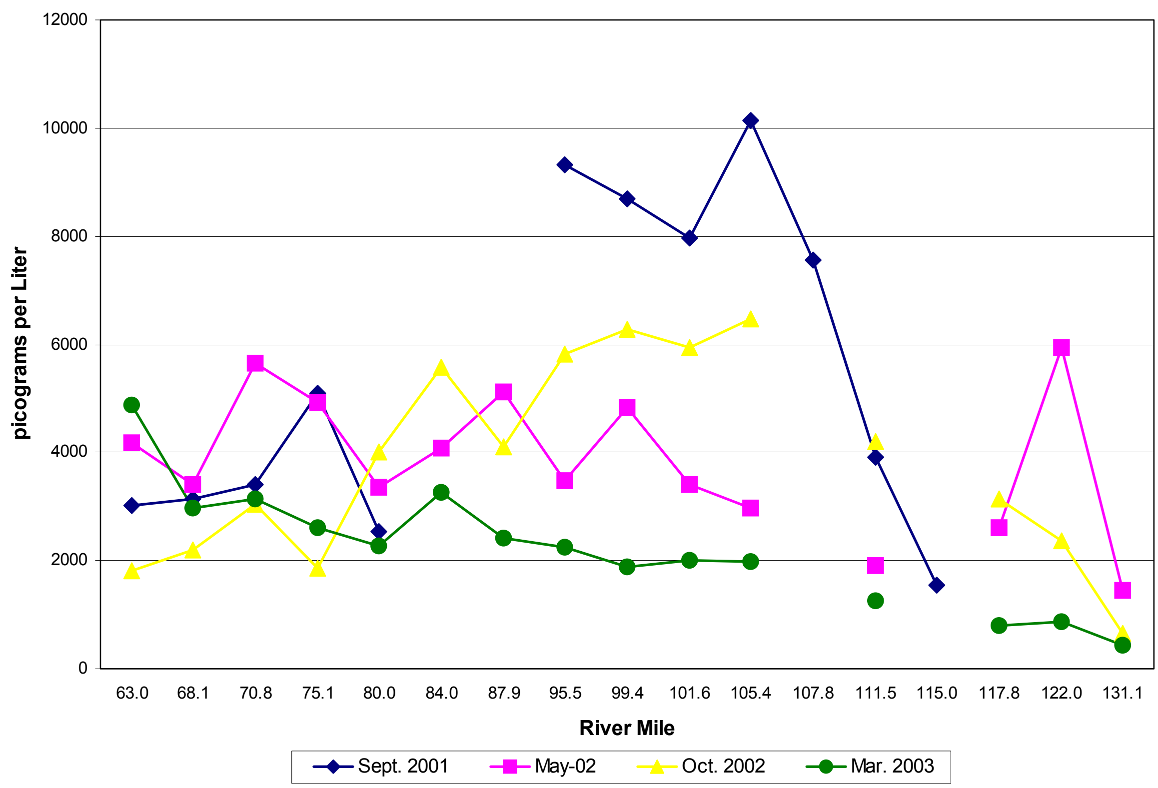

Figure 6: Concentrations of 124 PCB congeners at 15 locations in Zones 2 to 5 of the Delaware Estuary during varying flow conditions.

simulations were necessary to both confirm the model parameters established during the short-term calibration, and evaluate the time required for the sediments to reach pseudo steady-state with the overlying water column as loadings of PCBs were reduced.

The model will cycle model inputs from the period February 1, 2002 until January 31, 2003. This one year period is considered to be representative of long-term conditions (see Section 3.2.3.1), and is the same period utilized for long-term, decadal scale model simulations. Use of this one year cycling period, allowed consideration of seasonal variation in model input parameters such as tributary flows, tidal forcing functions, air and water temperature, wind velocity and loadings of penta-PCBs.

1.7.2 Monitoring Plan

The Delaware River Basin Commission has conducted nine surveys of the ambient waters of the Delaware Estuary between September 2001 and April 2003 to provide data for calibrating the water quality model for penta-PCBs that was used to establish the Stage 1 TMDLs. Samples collected during these surveys were analyzed using a more sensitive HRGC/HRMS method (Method 1668A) and larger sample volumes to obtain data at picogram per liter levels. The Commission plans to conduct additional surveys in both Zones 2 to 5 and in Delaware Bay (Zone 6) as part of the effort to calibrate water quality models for the other PCB homologs, and to establish and refine the TMDLs and associated WLAs and LAs for Stage 2. Contingent on available funding, the Commission plans to continue the ambient water surveys on a yearly basis to track the progress in achieving the load reductions and applicable water quality standards for PCBs.

In the spring of 2000, the Commission required 94 NPDES permittees to conduct monitoring of their continuous and stormwater discharges for 81 PCB congeners utilizing analytical methods that could achieve picogram per liter detection limits. The results of this monitoring indicated that loadings to the estuary zones from point sources were significant and of such magnitude to cause the water quality standards to be exceeded. These results have also be used to determine the need for and the frequency of additional monitoring in NPDES permits have been reissued in the last few years. Following approval of the Stage 1 TMDLs, most of the NPDES permittees included in the 2000 monitoring requirements will be required to conduct some additional monitoring using Method 1668A. These monitoring requirements will provided data in future years to assess the progress in achieving the TMDLs.

The Commission is also planning, contingent on available funding, to work cooperatively with the NJDEP and Rutgers University to continue air monitoring at Lums Pond near the western end of the C&D Canal and at a site in the NJ Pinelands which are located east of the estuary. Monitoring data at these sites and at a long-term site at Rutgers University will provided data to assess the long-term trends in regional background concentrations of PCBs (Lums Pond) and in regional concentrations in the estuary airshed.

1.7.3 Implementation Plan

Current EPA regulations do not require an implementation plan to be included with TMDLs. EPA NPDES regulations do require that effluent limitations must be consistent with approved WLAs [40 CFR Part 122.44(d)(1)(vii)(B)]. EPA regulations allow the use of non-numeric effluent limits in certain circumstances [40 CFR Part 122.44(K)]. In addition to EPA regulations, the Commission and its signatory parties currently have in place an implementation procedure for utilizing wasteload allocations and other effluent requirements formally issued by the Commission's Executive Director. This procedure has been in use for over 25 years with wasteload allocations for carbonaceous oxygen demand and other pollutants that were developed for discharges to the estuary. Section 4.30.7B.2.c.6). of the Commission regulations requires that WLAs developed by the Commission shall be referred to the appropriate state agency for use, as appropriate, in developing effluent limitations, schedules of compliance and other effluent requirements in NPDES permits.

As part of the implementation strategy, the NPDES permitting authorities believe that it is appropriate for 142 NPDES point source discharges to receive non-numeric WQBELs consistent with the WLAs. It is expected that the non-numeric WQBELs resulting from the Stage 1 WLAs require PCB minimization and reduction programs and additional monitoring using Method 1668A consistent with state and federal NPDES regulations. See Appendix 3 for details on the permit implications of this TMDL. These permit requirements are intended to expedite the reduction in PCB loadings to the estuary while Stage 2 TMDLs and WLAs are being completed.

A unique aspect of the implementation of these TMDLs is the establishment of a TMDL Implementation Advisory Committee (IAC)by the DRBC, which shall be asked to develop creative and cost-effective strategies for reducing PCB loadings and achieving the TMDLs for PCBs in the Delaware Estuary. The IAC will be encouraged to engage in creative, collaborative problem-solving. Its recommendations will be submitted to the Commission, which will consider them in consultation with all regulatory agencies whose approval is required to implement them. Each regulatory agency also will be represented on the IAC. The committee is expected to convene six times a year for two years.

1.7.4 Reasonable Assurance that the TMDLs will be Achieved

Data available to assess whether the TMDLs will be achieved include ambient water quality data collected by the Commission during routine surveys of Zones 2 through 6 of the Delaware River. Effluent quality data and source minimization plans required through NPDES permits issued by state permitting authorities will provide the basis for assessments regarding consistency with the WLAs developed or issued in Stage 1 and Stage 2. Commission regulations also require that the WLAs be reviewed and, if required, revised every five years, or as directed by the Commission. This will ensure that additional discharges of the pollutant or increased non-point source loadings in the future will be considered.

Achieving the reductions in the load allocations for tributaries will require the listing of the tributary on future Section 303(d) lists submitted by the estuary states for those tributaries that are not currently listed for impairment by PCBs, and completion and implementation of TMDLs for PCBs for those tributaries that are already listed as impaired by PCBs. Achieving the load reductions required for contaminated sites will require close coordination with the federal CERCLA programs and state programs overseeing the assessment and cleanup of these sites. In addition, the Commission has broad powers under Article 5 of the Delaware River Basin Compact (Public Law 87-328) to control future pollution and abate existing pollution in the waters of the basin including Section 2.3.5B of the Commission's Rules of Practice and Procedure (DRBC, 2002).

2. TWO STAGE APPROACH TO ESTABLISHING AND ALLOCATING TMDLs FOR PCBs

2.1 Background

Developing TMDLs for a complex pollutant in a complex estuarine ecosystem with numerous point and non-point sources is an enormous task requiring substantial levels of effort, funding and time. As discussed above, the deadlines contained in the Section 303(d) lists prepared by the States and approved by the U.S. EPA, Memoranda of Understanding, and Consent Decrees discussed above allocated five years for developing the TMDLs. A coordinated effort to develop the TMDLs was initiated in 2000 when Carol R. Collier, Executive Director of the Delaware River Basin Commission in a letter dated May 25, 2000 requested that U.S. EPA Regions II and III endorse the Commission as the lead agency in developing the TMDLs for PCBs in the Delaware Estuary. In a letter dated August 7, 2000, Region II endorsed the Commission's role as the lead agency to develop the TMDLs. An August 11, 2000 letter from Region III also acknowledge the important role of the Commission while identifying the legal constraints on the date for establishing the TMDLs. On July 26, 2000, the Commission passed Resolution 2000-13 stating that the Commission would continue its ongoing program to control the discharge of toxic substances, including PCBs, to the Delaware Estuary, and would work cooperatively with the signatory parties to the Delaware River Basin Compact and their agencies and affected parties in this effort.

2.2 Staged Approach

The complexity of a TMDL for a class of compounds such as PCBs, the limited time and data available, and the benefits of refining it through time with more data led to a decision to develop the TMDLs for PCBs in two stages consistent with EPA TMDL guidance. A staged approach provides for adaptive implementation through execution of load reduction strategies while additional monitoring and modeling efforts proceed. The approach recognizes that additional monitoring data and modeling results will be available following issuance of the Stage 1 TMDLs to enable a more refined analysis to form the basis of the Stage 2 TMDLs.

In the first stage, TMDLs and individual wasteload allocations were developed for each zone. Stage 1 WLAs were based upon a simplified methodology, while still meeting all of the regulatory requirements for establishing a TMDL. Consistent with the recommendations of an expert panel of scientists experienced with PCB modeling, these TMDLs were extrapolated from penta homolog data using the observed ratio in the Delaware Estuary of the penta homolog to total PCBs (see Section 3.4).

Stage 2 TMDLs, individual WLAs and LAs are targeted for development by December 31, 2005. Once the Stage 2 TMDLs are finalized, EPA expects the WLAs developed in Stage 2 to replace the Stage 1 WLAs. EPA expects the Stage 2 WLAs and LAs to be based on all of the monitoring data obtained through the development of the Stage 2 TMDLs, and the additional modeling that will be performed following the establishment of the Stage 1 TMDLs. Stage 2 TMDLs will also be based on the summation of the PCB homolog groups, without the use of extrapolation. It is anticipated that the Stage 2 WLAs will be based upon a more sophisticated allocation methodology than the Stage 1 WLAs, and will likely reflect application of the procedures set forth in the DRBC Water Quality Regulations.

As described in the documents released in April 2003 (Appendix 1) and following establishment of these TMDLs, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued or modified after the approval date must be consistent with the WLAs. The NPDES permitting authorities believe that these WQBELs will include non-numeric controls in the form of a best management practices (BMP) approach as the most appropriate way to identify and control discharges of PCBs consistent with the Stage 1 WLAs. Federal regulations (40 CFR Part 122.44(k)(4)) allow the use of non-numeric, BMP-based WQBELs in permits.

Guidelines describing appropriate NPDES permitting actions resulting from individual WLAs that may result following the establishment of the Stage 1 TMDLs by the U.S. Environmental Protection Agency are presented in Appendix 3. The guidelines include 1) the use of Method 1668A for any monitoring of the wastewater influent and effluent at a facility, 2) development of a PCB minimization plan, and 3) implementation of appropriate, cost-effective PCB minimization measures identified through the plan.

The identification of point source dischargers that are potentially significant sources of total PCBs is a dynamic process that depends on several factors including the availability and extent of PCB congener data for each discharge, the detection limit of the method used to analyze for PCB congeners, the flows used for each discharge, the procedure used to calculate the loadings, the location of the discharge in the estuary, and the proximity and loading of other sources of PCBs. EPA specifically requested comment on the list of significant point source dischargers, and has incorporated those comments, where appropriate, into this document (see Section 3.5). Expectations as to how the NPDES permits may appropriately address these specific WLAs can be found in Appendix 3.

An important component of the staged approach is the assessment and evaluation of options to control non-point sources of PCBs. These sources include contaminated sites (sites covered under CERCLA or RCRA), non-NPDES regulated stormwater discharges, tributaries to the estuary, air deposition, and contaminated sediments (see Section 1.4 and Appendix Tables 4-1). Addressing these sources is particularly important since contaminated sites and non-point stormwater discharges have been identified as the two largest categories of PCB loadings in this TMDL based upon current data and assessment procedures.

3. STAGE 1 APPROACH TO ESTABLISHING TMDLs

3.1 Background

TMDLs for total PCBs are estimates of the loading of the sum of all the PCB homologs that can enter the estuary and still meet the current water quality criteria. TMDLs are, by nature, abstract. They are the *projected*, not the current, loadings from all sources that should result in the achievement of water quality standards at all points in the estuary. Since current concentrations of PCB homologs are 500 times higher than the water quality criteria, the TMDLs and associated individual WLAs and LAs will be proportionately less.

In order to meet standards at all points in the estuary, some parts of the estuary will have to be less than the standard for that portion of the estuary. This is particularly true for these TMDLs in the Delaware Estuary since the water quality standards vary between the zones, and the standard in lower Zone 5 below the Delaware Memorial Bridges is approximately 5 times lower than the standards in Zones 2 to upper Zone 5 (see Section 1.4).

While simplistic approaches can be used to estimate TMDLs, significant effort has been devoted to developing and calibrating a hydrodynamic and water quality model for the Delaware Estuary to be used in establishing PCB TMDLs for this water body (DRBC, 2003a; DRBC, 2003b; DRBC, 2003c). There are several reasons why a more sophisticated approach is appropriate. These reasons include:

1. Zones 2 – 5 of the Delaware River are significantly influenced by tidal forces producing a 6 foot tidal range at Trenton, NJ and tidal excursions of up to 12 miles. The model incorporates this tidal movement in the hydrodynamic model (DRBC, 2003a).
2. PCBs are hydrophobic, sorb to dissolved, colloidal and particulate carbon, and are transported with carbon molecules and particulates associated with carbon. The model incorporates these

characteristics, partitions PCBs to each of these phases, and simulates the concentrations of the 3 phases in the estuary (DRBC, 2003b).

3. PCBs are a class of chemicals; each having different physical-chemical properties such as volatilization rate and partitioning rate. The model can incorporate these properties for each of the ten homolog groups (DRBC, 2003b).
4. There are many sources of PCBs enter the estuary at different locations in different amounts and at different times. The model can simulate the spatial and temporal nature of these sources (DRBC, 2003c).
5. A model can simulate the additional assimilative capacity provided by the burial of PCBs into the deeper layers of the estuary sediments, and the exchange of PCBs in the gas phase in the estuary airshed with the dissolved phase of PCBs in the ambient waters of the estuary (DRBC, 2003b).

3.2 Conceptual Approach

3.2.1 Guiding Principles

The TMDLs require that each source of PCBs including the sediment, air deposition meets water quality criteria by itself and in conjunction with all other sources. The procedure used to establish the TMDLs incorporates these principles by initially determining the concentration or loading from each source category followed by an assessment of the attainment of the water quality standards when loadings from all source categories are considered.

Another principle is that, when the water quality standards are met, additional loading of PCBs to the estuary is dependent on dilution by flows from other sources into the estuary, and the loss of PCBs through fate processes occurring in the estuary. Two of the source categories do not explicitly provide additional flows to the estuary and therefore do not provide assimilation capacity. The two sources are atmospheric dry deposition and gas phase transfer of PCBs, and contaminated sites. Ground and surface water flow from contaminated sites do occur, but these flows have not been adequately characterized and are not included in the current version of the penta-PCB model. As a result, the assimilative capacity for these sources must be obtained from other source categories.

All source categories and sources within categories are not created equally. Reductions in PCB loads in any source category will provide different amounts of assimilative capacity in different areas of the estuary. Figure7 illustrates this principle for the four boundaries of the penta-PCB model. In this example, each of the boundaries is set at a concentration of 100 milligrams per liter with the resulting model predicting ambient conservative chemical concentrations throughout the estuary. Of the four boundaries, the C&D Canal and the Schuylkill River have the smallest influence on conservative chemical concentrations in the estuary. This influence is also localized to the area where the source enters the estuary. The influence of the ocean boundary at the mouth of Delaware Bay appears to be limited to the Bay and the lower portions of Zone 5 (up to approximately River Mile 65). The Delaware River at Trenton, however, has a significant influence on the estuary conservative chemical concentrations from Zone 2 through Zone 5. Reductions in PCB loadings from the Delaware River at Trenton will therefore provide substantially more assimilative capacity in a larger area of the estuary.

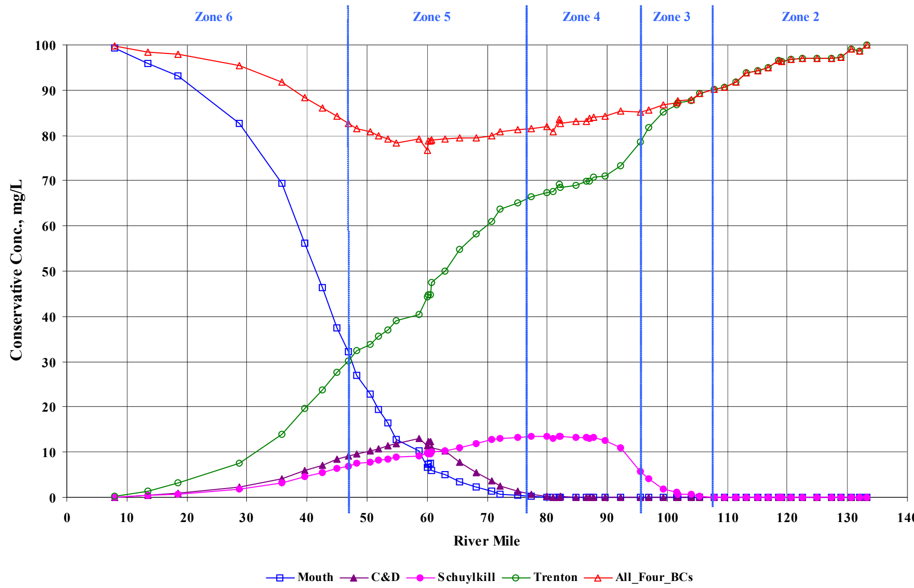

Figure 7: Relative impact of the four boundaries when the conservative chemical concentrations are set at 100 milligrams per liter.

Estuary sediments function as a sink or loss mechanism for PCBs through burial of PCBs that settle to the bottom of the estuary. This small (<1 cm/year) net deposition of particulates provides additional assimilation capacity in the estuary, and is incorporated in the calculation of the TMDLs for each of the zones.

Recent monitoring of air concentrations in the regional airshed surrounding the Delaware Estuary indicate that PCB concentrations are particularly high in the Philadelphia-Camden area, and contribute PCBs to the estuary through dry and wet deposition, and exchange of PCBs in the gas phase (Van Ry et al, 2002 and Figure 8). While the proportional loading of PCBs from dry and wet deposition is explicitly included in the load allocation portion of the TMDLs, the transfer of PCBs in the gas phase with dissolved PCBs in the estuarine waters is not since there will be no significant net exchange between dissolved PCBs in water and gas phase PCBs in the air (i.e., they will reach equilibrium) when water quality standards are achieved. The modeling approach used to develop the TMDLs takes this into account by setting the gas phase air concentrations at the equilibrium concentrations (see Section 3.3.1 and 3.3.5).

The difference between the current gas phase concentrations and the gas phase concentrations when the estuary meets standards, is a significant TMDL implementation issue since water quality standards will not be achieved without reducing the gas phase concentrations to a level where they are in equilibrium with the dissolved PCB concentrations at the water quality standard. Figure 8 illustrates the relative difference between the current gas phase air concentration of penta-PCBs in Zone 3 and the gas phase concentration at equilibrium with the dissolved penta-PCB concentrations when the TMDL is achieved.

Finally, the boundaries of the model which include the head of tide of the tributaries, the C&D Canal, and the mouth of Delaware Bay were assigned concentrations of penta-PCBs in determining the TMDLs and establishing WLAs. Section 4.20.4B.1 of the Commission's Water Quality Regulations specify that in establishing WLAs, the concentrations at the boundaries of the area of interest shall be set at the lower of actual data or the applicable water quality criteria (DRBC, 1996). Thus for modeling purposes, tributaries or other boundaries cannot exceed the water quality criteria for the zone of the estuary that they enter or border. In developing these TMDLs, both the C&D Canal boundary and the mouth of Delaware Bay boundary were set to 7.9 pg/L. This is the criterion for Zone 5 where the canal enters the mainstem of the Delaware River, and is the current criterion for Zone 6 (Delaware Bay). The current concentrations of PCBs at the mouth of the Bay exceed this value by 2 orders of magnitude, while current concentrations at the C&D Canal boundary exceed this value by almost 3 orders of magnitude. Thus like the gas phase concentrations of PCBs in the air, PCB concentrations at both the C&D Canal and the ocean boundary must also be reduced in order to achieve the water quality standards. The relative influence of these boundaries at the critical compliance location must also be considered in determining the relative importance of the required reductions (see Figure 7).

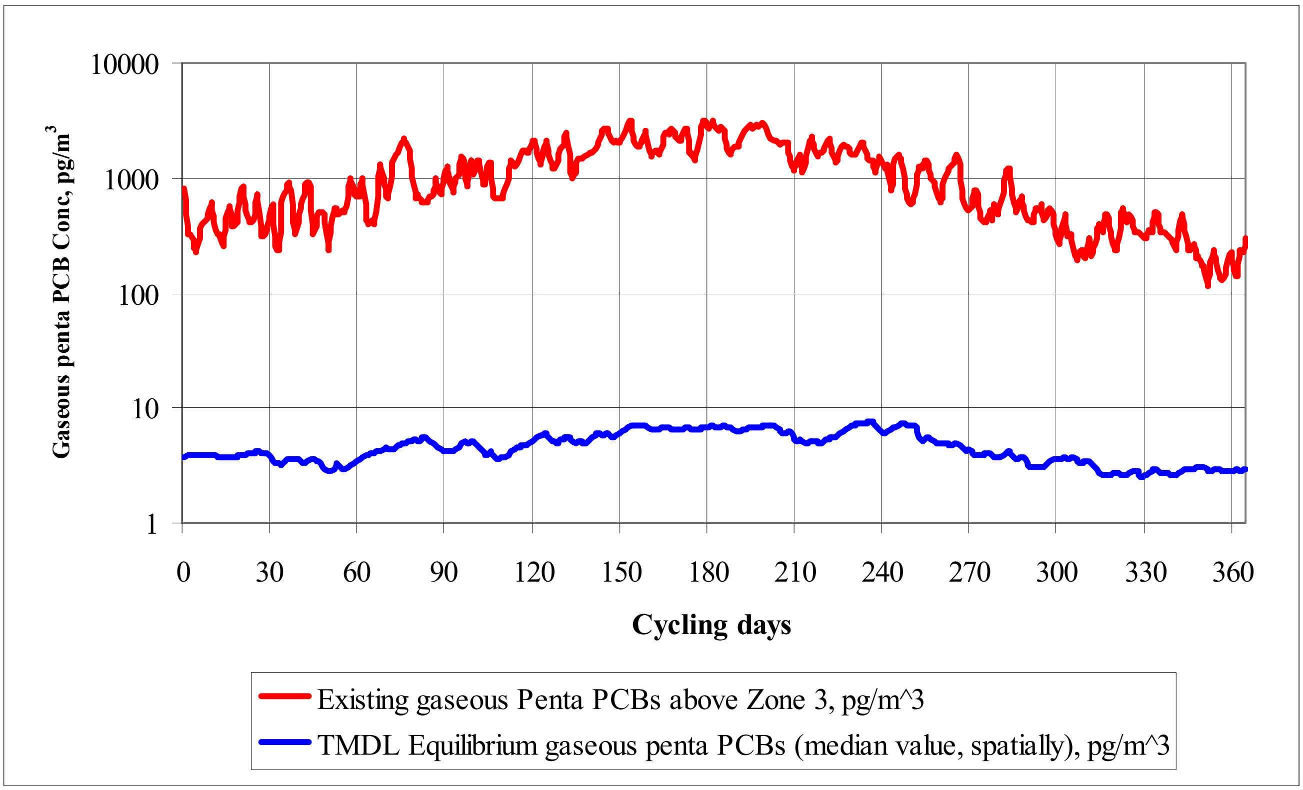

Figure 8: Atmospheric gas phase penta-PCB concentrations during the one year model cycling period based upon current data and the expected penta-PCB concentrations when the TMDLs are achieved.

3.2.2 Modeling Approach

Several mathematical models are used to develop the TMDLs for PCBs. The first is a hydrodynamic model that was extended to included Delaware Bay (Zone 6). The hydrodynamic model is discussed in Section 3.2.4.1 and fully described in the report entitled "DYNHYD5 Hydrodynamic Model (Version 2.0) and Chloride Water Quality Model for the Delaware River Estuary" (DRBC, 2003a). The water quality models used in this effort included an updated TOXI5 model for chlorides, and a new model for pentachlorobiphenyls (penta-PCBs)(DRBC, 2003b). The hydrodynamic and chloride models are discussed in Section 3.2.4.1 and

3.2.4.1, respectively and described in detail in the report on the hydrodynamic model (DRBC, 2003a). The organic carbon and penta-PCB models are discussed in Section 3.2.4.3 and fully described in the report entitled "PCB Water Quality Model for the Delaware Estuary (DELPCB)" (DRBC, 2003b).

TMDLs are calculated using both the conservative chemical model, and the penta-PCB water quality model run until equilibrium is observed. The model cycles model inputs from the period February 1, 2002 until January 31, 2003. This one year period is considered to be representative of long-term conditions (see Section 3.2.3.1), and is the same period utilized for the decadal scale (74 year) model simulations by HydroQual, Inc.

3.2.3 TMDL Approach

Although the water quality standards are expressed as total PCBs and the TMDLs must be expressed as Total PCBs, the current water quality model only addresses penta-PCBs. As discussed in Section 2.2, the TMDLs for total PCBs are extrapolated from TMDLs for penta-PCBs using the observed ratio in the Delaware River/Estuary of the penta homolog to total PCBs. Therefore, a water quality target for penta-PCBs must be established for use in the TMDL procedures. This target is determined by assuming that the ratio of penta-PCBs to total PCBs is approximately 0.25.

TMDLs for total PCBs for Zones 2 through 5 of the Delaware Estuary are established using a four step procedure. TMDLs are calculated over a one year period (annual median) to be consistent with both the model simulations and the 70 year exposure used for human health criteria. The procedure initially utilizes the conservative chemical model to establish contribution factors (Cfs) for two of the major tributaries to the estuary (the Delaware River at Trenton and the Schuylkill River), and each of the estuary zones. Allowable loadings are then calculated for each of these sources utilizing the CF and the proportion of the water quality target at the critical location allocated to each source. These loadings are used in the conservative chemical and penta-PCB models to establish the assimilative capacity provided by burial of PCBs into the estuary sediments. The gas phase concentrations that would be in equilibrium with the penta-PCB water concentrations when the water quality targets are met are then included in the water quality model. The model is then run to confirm that the water quality targets are still being met.

Following establishment of the TMDLs for each zone, each of the zone TMDLs are apportioned using the current percentage contribution for each of the source categories excluding loads from the Delaware River, Schuylkill River and contaminated sites based upon the respective loadings during the period Feb. 1, 2002 to Jan. 31, 2003 (Table 2, Figure 9)

Table 2: Apportionment of Zone TMDLs to Wasteload and Load Allocations excluding loads from the Delaware River, Schuylkill River and contaminated sites.

ZONE	WASTELOAD ALLOCATION	LOAD ALLOCATION
2	44.1%	55.9 %
3	78.1%	21.9 %
4	60.8%	39.2 %
5	63.4 %	36.6 %

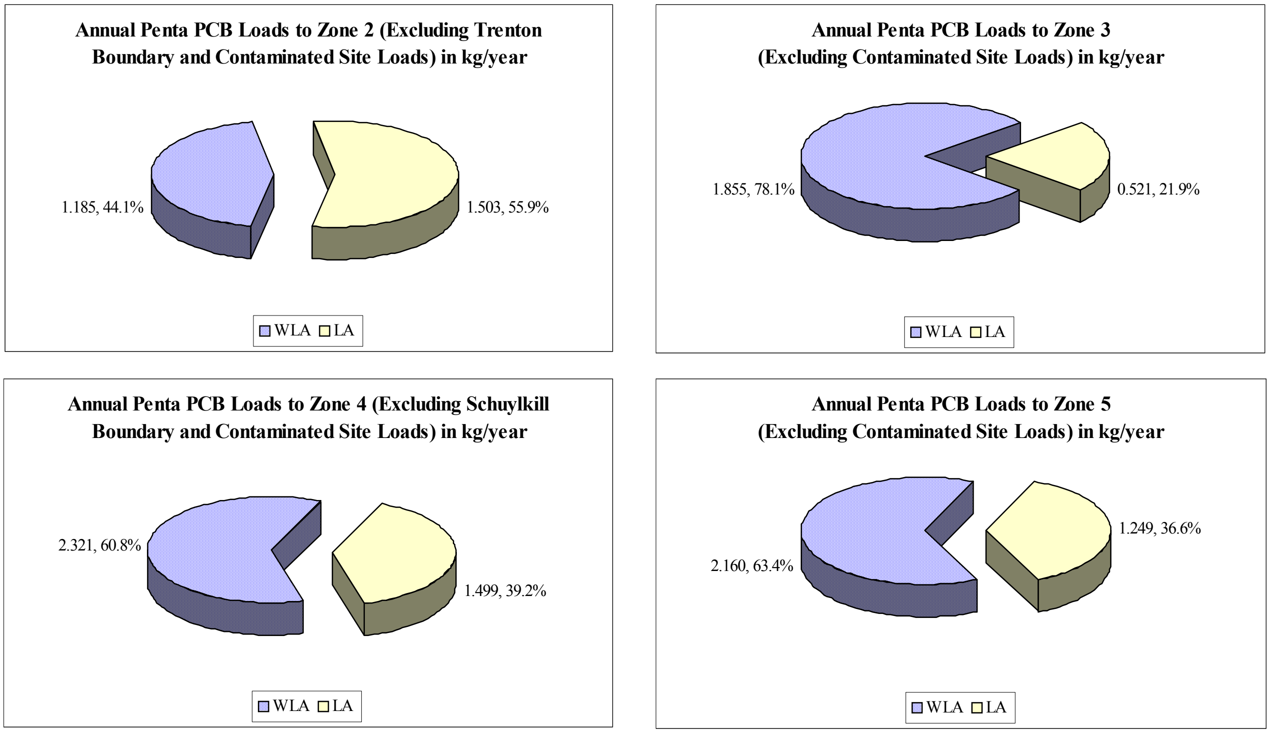

Figure 9: Apportionment of Zone TMDLs in kilograms per year (kg/year) to Wasteload and Load Allocations excluding loads from the Delaware River, Schuylkill River and contaminated sites.

The wasteload allocation portion of the TMDL represents those source categories that are regulated under the NPDES program (point sources, combined sewer overflows or CSOs, and municipal separate storm sewer systems or MS4s). The load allocation portion of the TMDL represents the remaining categories including contaminated sites, non-NPDES regulated stormwater discharges, tributaries and air deposition).

In accordance with the TMDL regulations, a portion of each zone TMDL must be allocated to a margin of safety. The margin of safety (MOS) is intended to account for any lack of knowledge concerning the relationships between pollutant loadings and receiving water quality. Commission regulations also require that a portion of the TMDL be set aside as a margin of safety, with the proportion reflecting the degree of uncertainty in the data and resulting water quality-based controls. The MOS can be incorporated into the TMDL either implicitly in the design conditions under which the TMDL is calculated or explicitly by assigning a fixed proportion of the TMDL. Since the conditions under which the TMDL is determined like tributary flows are related to the long-term conditions and not to design conditions associated with human health water quality standard for carcinogens (such as the harmonic mean flow of tributaries), expression of the MOS as an explicit percentage of each zone TMDL was considered the more appropriate approach. An explicit percentage of 5% was then utilized in the apportionment of the zone TMDLs. Both the apportionment of the zone TMDLs using the current percentage contribution and use of a margin of safety of 5% were recommended by the Commission's Toxic Advisory Committee.

3.2.4 Model Descriptions and Inputs

3.2.4.1 Hydrodynamic Model

Inputs to the hydrodynamic, conservative chemical and PCB models included daily tributary flows at the two major tributary boundary conditions, the Delaware River at Trenton and the Schuylkill River, and at 20 minor tributaries for the period February 1, 2002 to January 31, 2003. A comparison of the cumulative distribution curve for this one year period to the curve for the period of record for the Delaware River at Trenton (1912 to March 2003) and the Schuylkill River (1934 to March 2003) is presented in Figures 10 and 11, respectively. The figures indicate that the flows occurring during the one year cycling period are a reasonable representation of the flows during the period of record for these two tributaries.

The hydrodynamic model also includes precipitation induced flows for both point and non-point sources. The precipitation pattern occurring during the one year cycling period was compared to historical precipitation records (1872 to March 2003) maintained by the Franklin Institute (2003) to determine the degree to which the precipitation pattern for the one year cycling period was representative of the long term record. This comparison indicated good agreement for both the number and percentage of days when precipitation exceeded 0.01 inches, and the number and percentage of days when precipitation was less than 0.01 inches (Figures 12 and 13). This precipitation data was used to both calculate the flow of each discharge during precipitation events and determine when data collected during precipitation events would be used in loading calculations.

The tidal forcing function in the hydrodynamic model was based upon actual tide data for the one year cycling period. Since the major component of the tidal function has a periodicity of 12.42 hours and minor components with lunar and annual periodicity, this data set was considered representative of long-term tidal conditions. In addition, the expert panel recommended that alternative model inputs based upon design conditions not be used in TMDL simulations in order to maintain any hydrological relationships between the various inputs. For this reason, actual discharge flows for the point sources included in this TMDL determination during the one year cycling period were used rather than design effluent flows such as those specified in Section 4.30.7A.8. of the Commission's Water Quality Regulations or federal NPDES regulations. This is particularly important in the establishment of PCB TMDLs for the Delaware Estuary since the flow from a number of the point sources is significantly influenced by precipitation. For example, design effluent flows for the City of Philadelphia's wastewater treatment plants are approximately 200 million gallons per day, but can double during precipitation events. In addition, procedures have not been developed nor does the Commission's regulations specify procedures to establish design effluent flows for those discharges that are solely driven by precipitation (i.e., stormwater discharges). Such procedures and regulations will be developed for application in the Stage 2 TMDLs for PCBs, if necessary. The similarity of the precipitation pattern observed during the one year cycling period to the long term precipitation record suggests that the precipitation induced flows for both continuous and stormwater discharges used to develop the Stage 1 TMDLs may ultimately serve as design flows for these discharges.

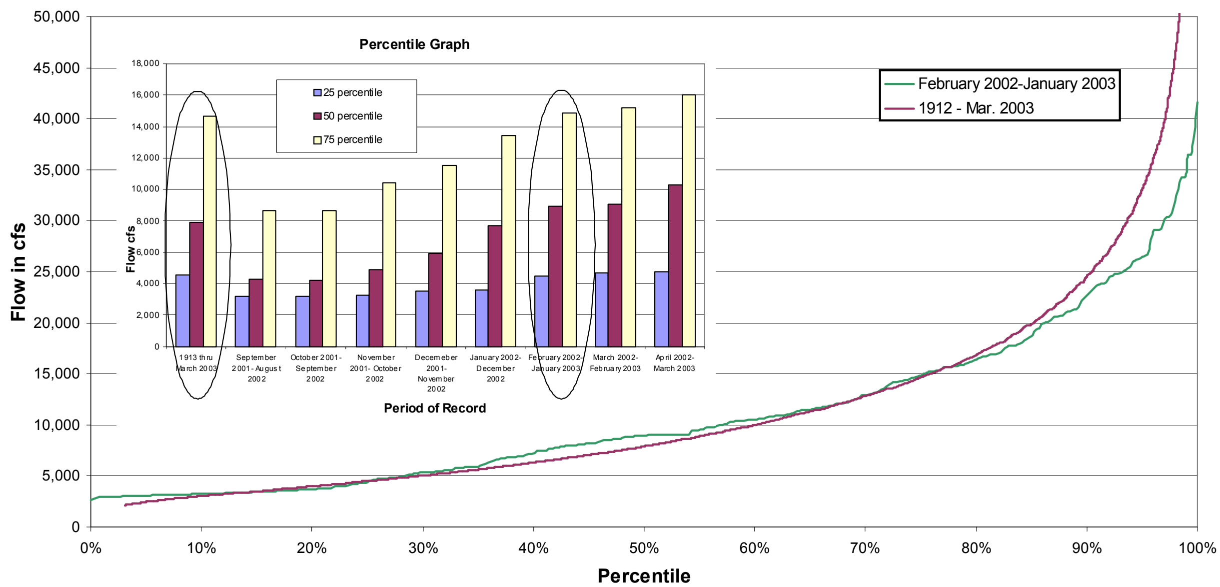

Figure 10: Cumulative distribution curve for the period of record for the Delaware River at Trenton (1912 to March 2003) compared to the period February 1, 2002 to January 31, 2003.

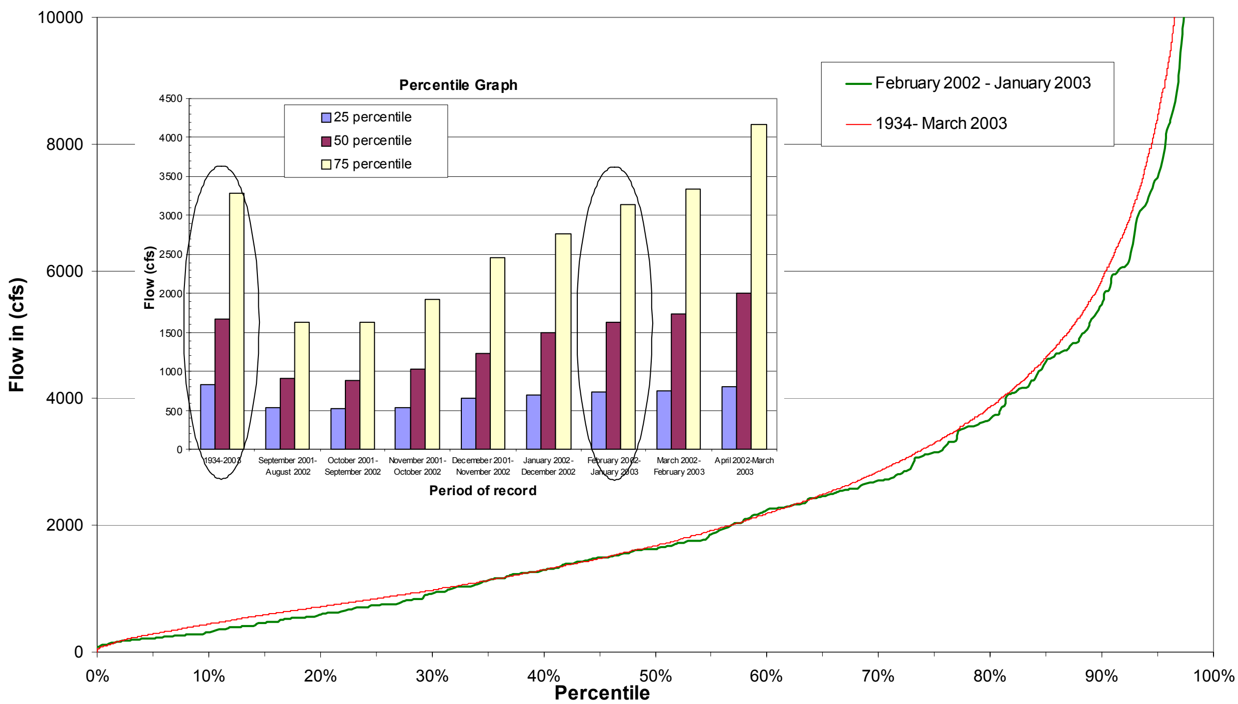

Figure 11: Cumulative distribution curve for the period of record for the Schuylkill River (1934 to March 2003) compared to the period February 1, 2002 to January 31, 2003.

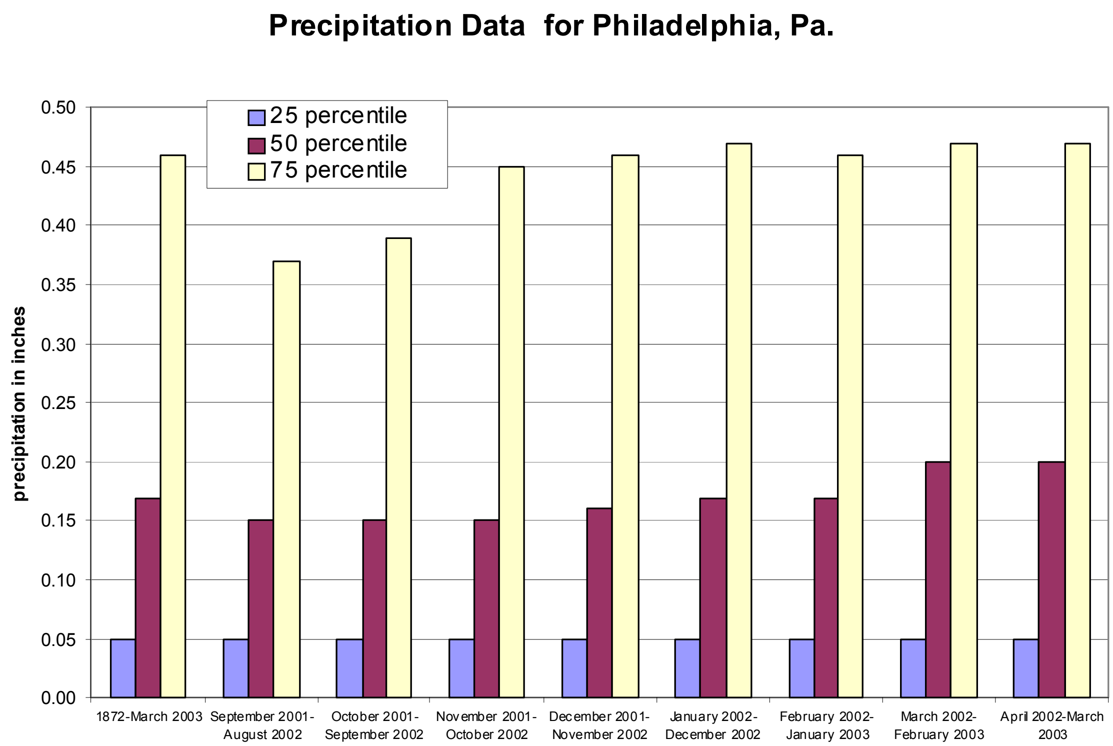

Figure 12: Percentile curves for precipitation data (events > 0.01 inches) for Philadelphia, PA from 1872 to March 2003 compared to the period February 1, 2002 to January 31, 2003.

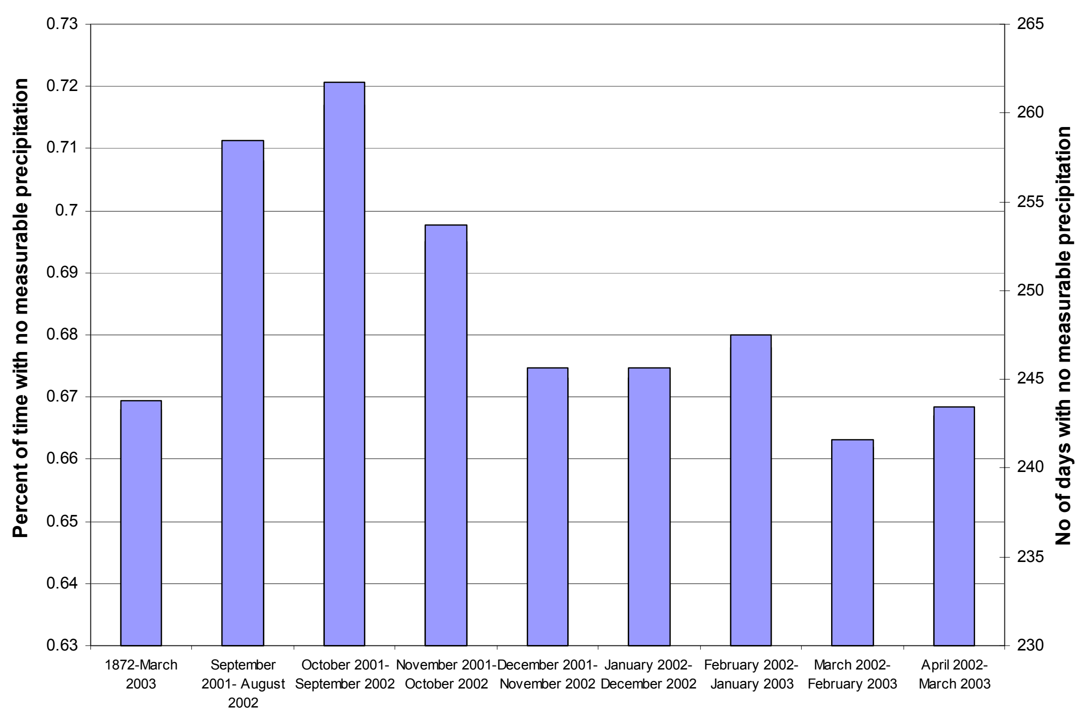

Figure 13: Percentile curves for precipitation data (days with precipitation < 0.01 inches) for Philadelphia, PA from 1872 to March 2003 compared to the period February 1, 2002 to January 31, 2003.

3.2.4.2 Conservative Chemical Water Quality Model

A TOXI5 (water quality) model consisting of 87 water column segments was then linked with the outputs from the calibrated DYNHYD5 hydrodynamic model and calibrated against the chloride concentrations. This model is based upon the U.S. EPA's Water Quality Simulation Program (WASP) Version 5.12., and does not include any fate processes for chlorides or any interaction of the chlorides with the sediment. The main objective in this calibration process was the determination of an advection factor and a set of dispersion coefficients for the water quality model to correctly simulate the dispersive mixing within the Estuary. Review of comparison plots and the results of regression analyses indicated that the model was able to reproduce the temporal and spatial trends, and the magnitude of the chloride concentrations, within a reasonable range throughout the tidal portion of the Delaware River.

3.2.4.3 Penta-PCB and Organic Carbon Water Quality Models

The calibrated hydrodynamic and conservative chemical model are used to drive mass balance models of organic carbon and penta-PCBs (DELPCB). DELPCB is a simulation program enhanced from the U.S. EPA's Water Quality Simulation Program (WASP) Version 5.12, and is fully described in DRBC (2003c). The organic carbon model has two organic carbon state variables and one inorganic solid (IS) as a control state variable. These variables are integrated with the one-dimensional hydrodynamic DYNHYD5 model to dynamically simulate these sorbent variables. The two carbon variables are biotic carbon (BIC), carbon generated internally by phytoplankton, and particulate detrital carbon (PDC) which consists of detritus and other forms of non-living carbon. The model treats the two organic carbon sorbents as non-conservative state variables that are advected and dispersed among water segments, that settle to and erode from benthic segments, and that move between benthic layer segments through net sedimentation.

The model also partitions penta-PCBs into particulate- PCB, truly dissolved-PCB, and dissolved organic carbon (DOC) bound phases treated as individual state variables. The real time model simulates tide-induced flows, and the spatial and temporal distributions of the organic carbon and penta-PCB variables. During the modeling process, using data generated by the hydrodynamic model, DELPCB simulates the spatial and temporal distributions of water quality parameters including BIC, PDC, total penta-PCB, particulate penta-PCB, and truly dissolved PCB, and DOC-bound PCB. The sum of the latter two is total dissolved penta-PCB.

3.2.4.4 Model Inputs

Additional inputs to the models include air and water temperature, wind data and the loadings of penta-PCBs from various source categories for the period February 1, 2002 to January 31, 2003. Water temperature data were obtained from three automatic water quality monitoring stations operated cooperatively by the DRBC and the U.S. Geological Survey at the Ben Franklin Bridge, Chester, PA and Reedy Island. Air temperature and wind speed data were obtained from the National Weather Service at the Philadelphia International Airport station.

Daily loadings of organic carbon and penta -PCBs were estimated for relevant source categories, including contaminated sites, non-point sources, point discharges, atmospheric deposition, and model boundaries, for each day of the one year cycling period. Detailed discussion of load development for each source category is described in Section 2 of the report entitled "Calibration of the PCB Water Quality Model for the Delaware Estuary for Carbon and Penta-PCBs" (DRBC, 2003c).

3.3 Procedure for Establishing TMDLs

3.3.1 Summary

TMDLs for total PCBs for Zones 2 through 5 of the Delaware Estuary are established using a multi-step procedure that incorporated the guiding principles discussed in Section 3.2.1. As discussed in Section 1.4, the existing DRBC water quality standards are used as the basis for the Stage 1 TMDLs. The selection of these standards establishes the transition from a standard of 44.8 pg/L in upper Zone 5 to a standard of 7.9 pg/L in lower Zone 5 as the critical location for ensuring that standards are met throughout the estuary. Standards that are lower than upstream water quality standards typically require ambient water concentrations in upstream waters to be lower than the applicable standards for those waters. In tidal waters such as the Delaware Estuary, downstream waters with less stringent water quality standards can have the same effect on upstream waters depending on the extent of upstream movement during flooding tides. With the use of the existing DRBC water quality standards as the basis for the TMDLs in Stage 1, the critical location occurs where the 7.9 pg/L standard becomes effective (River Mile 68.75, the site of the Delaware Memorial Bridges).

The procedure initially utilizes the conservative chemical model to establish contribution factors for two of the major tributaries to the estuary (the Delaware River at Trenton and the Schuylkill River), and each of the estuary zones. The reasons for utilizing the contribution factor approach and the conservative model are 1) TMDLs are controlled by the value of the standard at the critical location, and 2) computer simulation time is minimized permitting the numerous iterations necessary to perform the procedure (approximately five hours for a 50 year simulation with the penta-PCB water quality model). The factors represent the contribution of each of the six sources in picograms per liter to the concentration of penta-PCBs at the critical compliance location. The loading into each zone is assigned as distributed loadings by utilizing a weighting factor calculated using the surface area of the model segments within the zone. For each of the estuary zones, the contribution factor has the units of pg/L per unit of loading. The unit of loading is relative to magnitude of the water quality standard. For example, conventional pollutants with standards in units of milligrams per liter (parts per million) and toxic pollutants with standards in micrograms per liter (parts per billion), loading is often expressed in kilograms per day. With the standard for PCBs in the picograms per liter range, however, loading is more appropriately expressed in terms of milligrams per day. Different units are used for the two major tributaries since the model calculates the loading of PCBs from these tributaries using the daily flows and the concentration of penta-PCBs. Therefore, the contribution factor for these two sources are expressed in units of pg/L per pg/L of penta-PCBs at the tributary boundary compared to pg/L per 100 mg/day for the loadings from the zones.

TMDLs are calculated in a four step procedure (Figure 14). The four steps are:

1. Calculate the contribution factor for each of the estuary zones and two of the tributary model boundaries to the critical compliance point with the penta-PCB water quality target.
2. Determine the proportion of the water quality target allocated to each of these six sources utilizing the median daily flow contributed by each during the one year model cycling period. Calculate the allowable loadings from each of these sources utilizing the CF and the proportion of the water quality target at the critical location allocated to each source. Then utilize these loadings in the conservative chemical and penta-PCB models to establish the assimilative capacity provided by burial of PCBs into the estuary sediments. Iteratively determine the amount of assimilative capacity (in pg/L) provided by the sediments, and add this concentration to the penta-PCB water quality target. Recalculate the allowable loadings from each of the six sources using this revised water quality target.
3. Utilize the water quality model for penta-PCBs with these allowable loadings to confirm that the sediment concentrations have reached pseudo-steady state, and confirm that the penta-PCB water quality target is met in Zones 2 through 5. Initial

penta-PCB conditions in the water and sediments are updated to shorten the simulation time to reach peudo steady-state in Step 4.

4. Estimate the gas phase concentrations that would be in equilibrium with the penta-PCB water concentrations when the water quality targets are met, include these in the water quality model and then confirm that the water quality targets are still being met. Iteratively adjust the gas phase concentration of penta-PCBs in the air until the water quality target is reached. The air will neither be a source or sink for penta-PCBs when the estuary meets the water quality standard and gas phase concentrations are reduced to the equilibrium concentration.

3.3.2 Step 1

In determining the contribution factor for the two tributary boundaries and the four estuary zones, the boundary of interest is set to 1 pg/L and all other model boundaries except the one of interest are set to zero pg/L. Model simulations are then run for 10 years to ensure that equilibrium conditions are achieved, and the annual median value is then calculated for each model segment in the main stem of the river. Figures 15 through 17 illustrate how the contribution factor is determined for the four model boundaries. These figures indicate the concentration of penta-PCBs at the critical point when a concentration of 1 pg/L is set at the model boundary.

Table 3 lists the contribution factors determined by this analysis for all of the model boundaries and each of the estuary zones.

Table 3: Summary of the contribution factors from the model boundaries and the estuary zones at the criteria critical point (Model segment 24 - River Mile 68.1).

Estuary Zone/Boundary	**Contribution Factor [pg/L] per [100 mg/day]**	**Contribution Factor [pg/L] per [pg/L]**
Zone 2	1.9668	-
Zone 3	2.1428	-
Zone 4	2.2813	-
Zone 5	0.96704	-
Delaware River @ Trenton	-	0.5815
Schuylkill River	-	0.11839
Ocean & C&D Canal	-	-

3.3.3 Step 2

Once the contribution factors are determined, the next step is to determine the allowable loadings from each of these sources that will still ensure that the water quality target is met at the critical location. The following assumptions are made in determining these loadings:

a. The assimilative capacity at the critical location controls the allowable loadings from each source. In concentration units, this assimilative capacity is equal to one-quarter of the applicable water quality standard or 1.975 pg/L of penta-PCBs.
b. The influence from ocean (the mouth of Delaware Bay) and the C&D Canal are treated as background. This is based in part upon their minimal influence at the critical location..
c. Net burial of PCBs into the sediment results in a loss of PCBs from the system. This removal of PCBs provides assimilative capacity that can be utilized by other sources. At the critical location, this additional assimilative capacity is approximately 0.5 pg/L of penta-PCBs.
d. When the concentration of penta-PCBs meets the water quality targets throughout the estuary, the concentration of penta-PCBs in the gas phase will be at equilibrium with the truly dissolved penta-PCBs in the water column, and the net flux of penta-PCBs will be zero. Thus, the air will neither be a source or sink for penta-PCBs when the estuary meets the water quality standard and gas phase are concentrations are reduced to the equilibrium concentration.

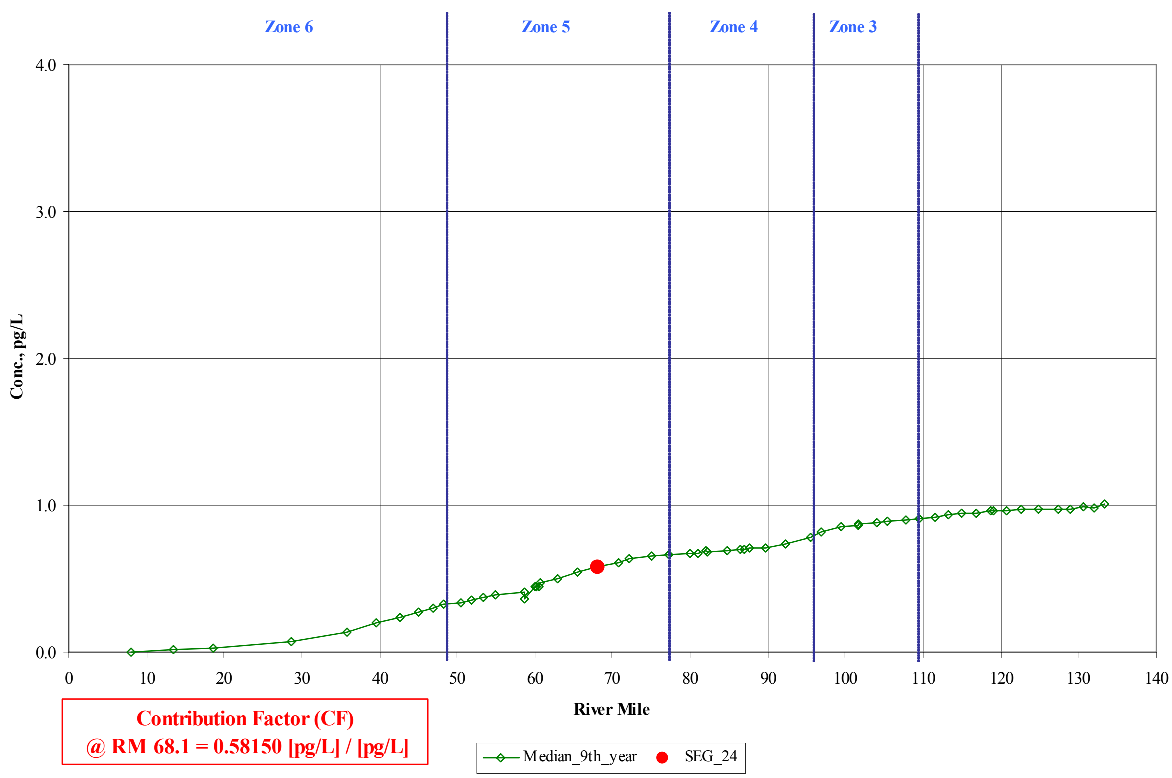

Figure 15: Simulated penta-PCB concentrations in the water column when the concentration of the Delaware River at Trenton, NJ is set to 1 picogram per liter.

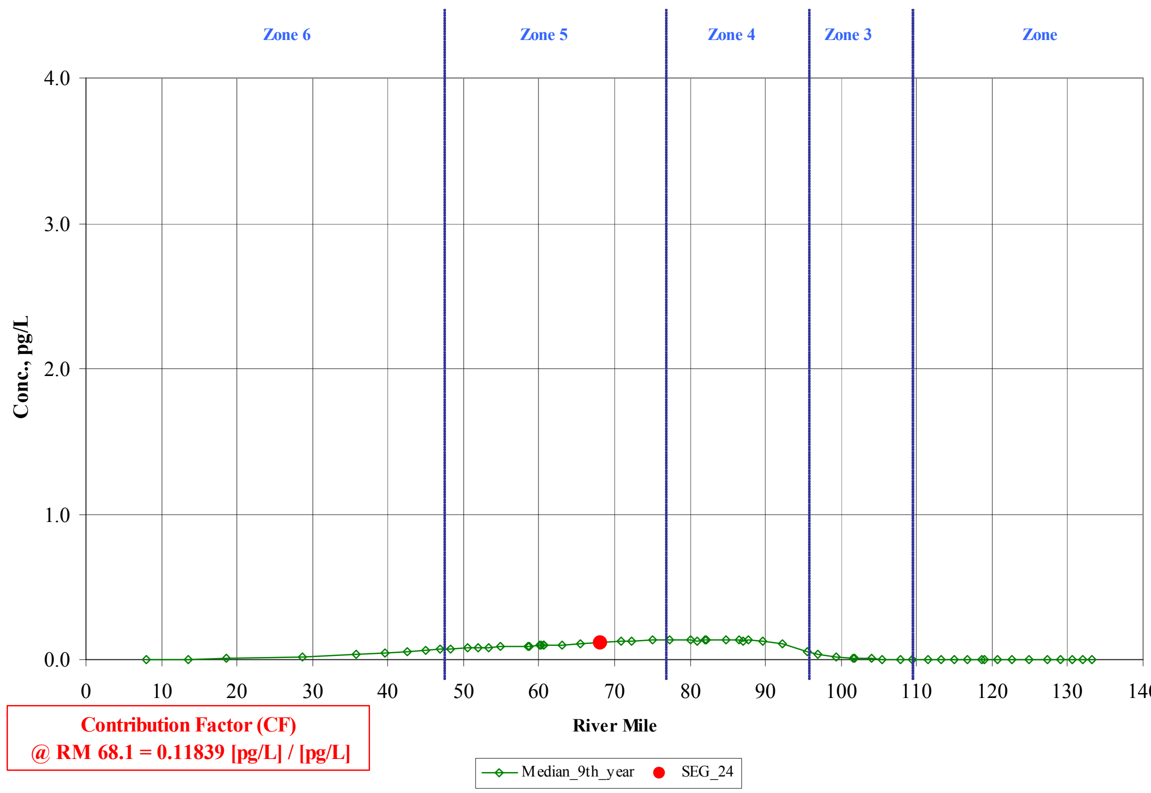

Figure 16: Simulated penta-PCB concentrations in the water column when the concentration of the Schuylkill River is set to 1 picogram per liter.

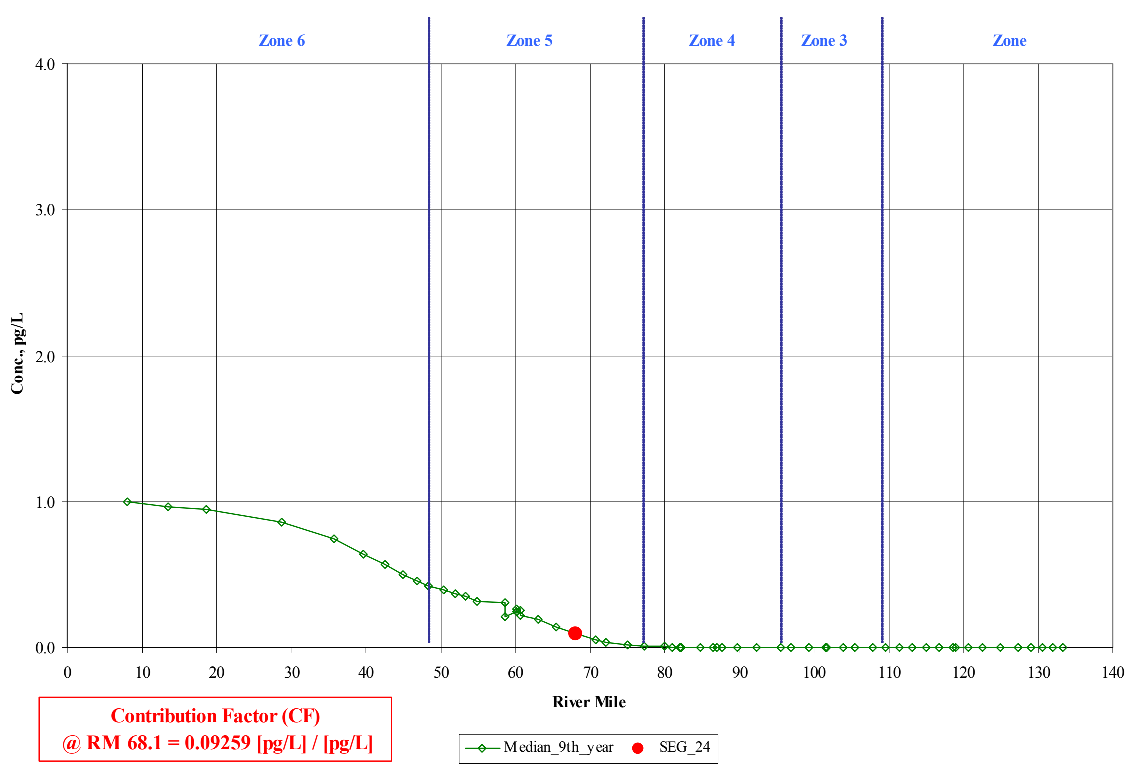

Figure 17: Simulated penta-PCB concentrations in the water column when the concentration at the mouth of Delaware Bay and the C&D Canal is set to 1 picogram per liter.

Using the principle that the assimilative capacity of the two tributary boundaries and each of the zones is based upon the inflow provided by each source, the percentage distribution of the assimilative capacity for each of these sources is established. Table 4 presents the flows for each of the sources during the one year model cycling period and the percentage distribution of the assimilative capacity based upon these flows. This distribution percentage is then applied to the penta-PCB water quality target of 1.975 pg/L to establish the contribution of each of the sources in picograms/liter to the target (Table 4). The influence of the mouth of Delaware Bay and the C&D Canal is first removed since this influence is considered background based in part on their minimal influence at the critical location. The additional assimilative capacity provided by the burial of PCBs into the estuary sediments was then estimated by inserting these loads in the conservative chemical and penta-PCB models. The results of this process was that the additional assimilative capacity was estimated to be 0.5 pg/L. This increased the assimilative capacity to 2.2921 pg/L (1.975 pg/L minus 0.183 pg/L for the background influences, plus 0.500 pg/L additional for burial by sediments) at the critical location. The contribution of each of the sources in picograms/liter to the target was then recalculated and used with the contribution factor to establish the allowable concentration or loadings for each of the tributary boundaries and estuary zones, respectively (Table 4).

At this point, a total allowable loading or assimilative capacity of 94.99 mg/day of penta-PCBs for all six sources was calculated. The majority of this loading was assigned to the two tributary boundaries, the Delaware River at Trenton and the Schuylkill River. Figure 18 graphically presents the available assimilative capacity at the critical location and the apportionment to each of the sources and estuary zones. Figure 19 presents the results of simulations using the conservative chemical model demonstrating that the calculated loadings result in attainment of the revised water quality target of 2.475 pg/L.

Table 4: Summary of Steps 1 and 2 of the Procedure for Establishing TMDLs

Sources of Loadings	**Contribution Factor (CF)**	**Mean Daily Flow During 1 Year Cycling Period**	**Distribution Percentage**	**Concentration at the Critical Location**	**Allowable Concentrations or Loadings.**	**Allowable Loadings (TMDL)**
Units	[pg/L] / [pg/L] or [pg/L] / [100mg/day]		%	pg/L	pg/L or mg/day	mg/day
Trenton	0.581500*	249.19	68.0	1.559	2.68*	57.727
Schuylkill	0.118390*	45.87	12.5	0.287	2.42*	9.609
Zone 2	1.966800	20.79	5.7	0.130	6.61	6.613
Zone 3	2.142800	15.26	4.2	0.095	4.46	4.455
Zone 4	2.281300	16.66	4.5	0.104	4.57	4.569
Zone 5	0.967040	18.57	5.1	0.116	12.02	12.016
Sum		366.3	100	2.2921	-	94.99

* - Units are either [pg/L] / [pg/L] or pg/L.

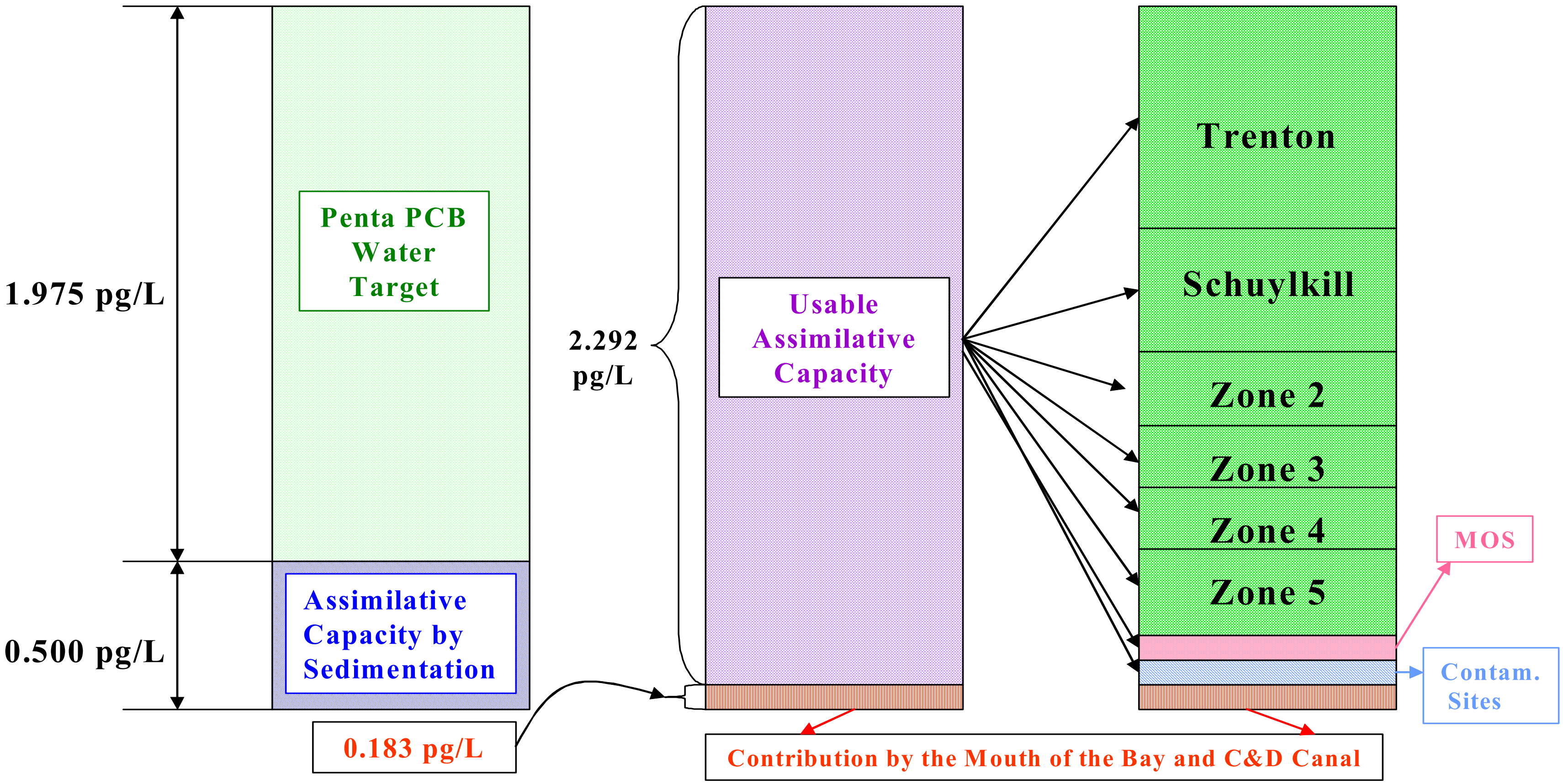

Figure 18: Graphical presentation of the allocation of the assimilative capacity at the critical location.

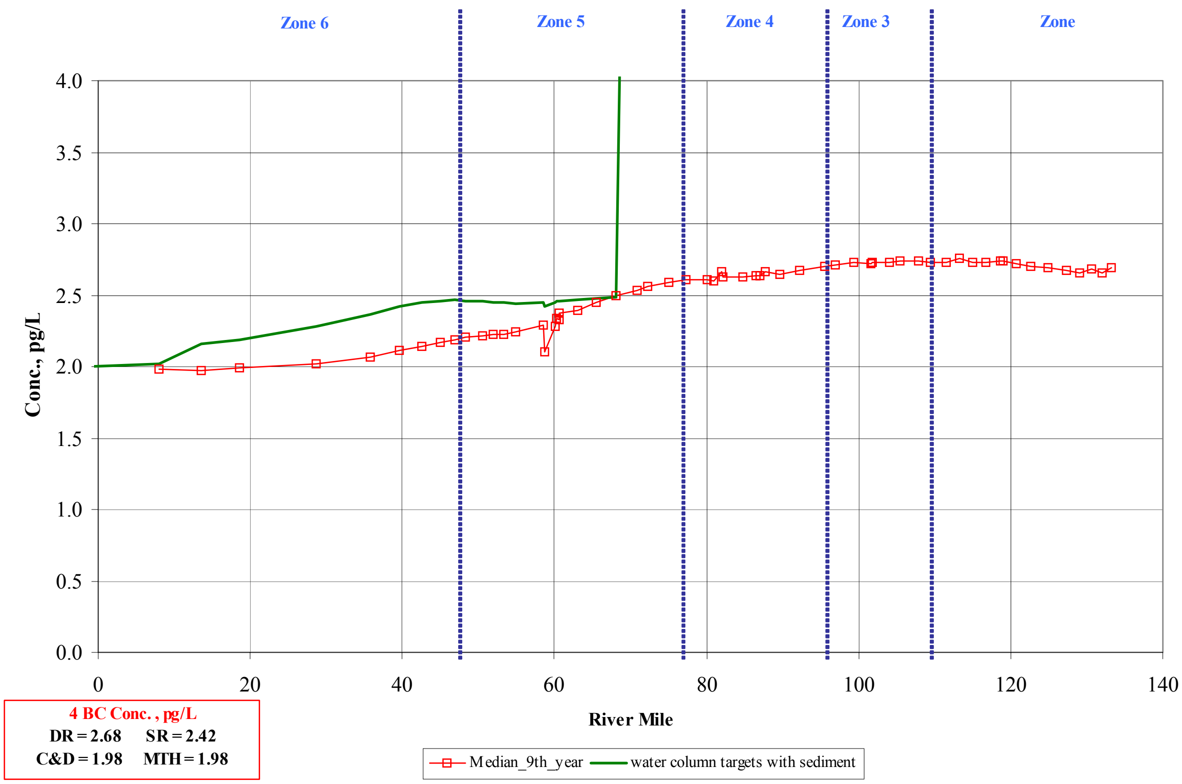

Figure 19: Simulated penta-PCB concentrations in the water column when loadings established in Step1 are used in the conservative chemical model.

3.3.4 Step 3

The next two steps will utilize the water quality model for penta-PCBs to confirm the assimilative capacity that was added due to the loss of PCBs by burial by the sediment, to confirm that sediment concentrations have reached steady-state, and to make final adjustments to account for the exchange of penta-PCBs in the truly dissolved phase with penta-PCBs in the gaseous phase in the estuary airshed.

In this step, the PCB water quality model is run with the initial water column concentrations set to the concentrations described by the final simulation with the conservative chemical model (Figure 19), the loadings from the model boundaries and to each estuary zone that were determined in Step 2, initial penta-PCB concentrations in the sediment, and no air-water exchange of gaseous penta-PCBs. The purpose of this simulation is to determine the sediment concentrations that are in equilibrium with the estuary concentrations that will meet the water quality target of 1.975 pg/L at the critical location. These simulations were run for 50 years to establish the point at which equilibrium was reach between the water column and the sediments. Figure 20 indicates the sediment concentration of penta-PCBs at six locations in the estuary corresponding to a model segment in each of the estuary zones and Delaware Bay. Note that sediment concentrations in all segments reach equilibrium after 20 to 30 years from the assigned initial conditions. The simulated median sediment concentrations at each of the model segments is presented in Figure 21. The amount of assimilative capacity provided by the loss of penta-PCBs to the sediment is illustrated in Figure 22. The figure indicates that the amount of assimilative capacity provided by the sediments varies along the estuary due to the varying burial rates computed by the model. The assimilation capacity provided is about 0.5 pg/L at the critical location.

The penta-PCB model was then rerun for ten years with the initial sediment conditions set to these values along with the loadings from the model boundaries and to each of the estuary zones to confirm that the water quality target at the critical location was being met. Figure 23 presents a plot of the annual median values during the ninth year of the simulation, confirming that the water quality target is being met. Figure 24 demonstrates that the sediments are in equilibrium during the simulation period.

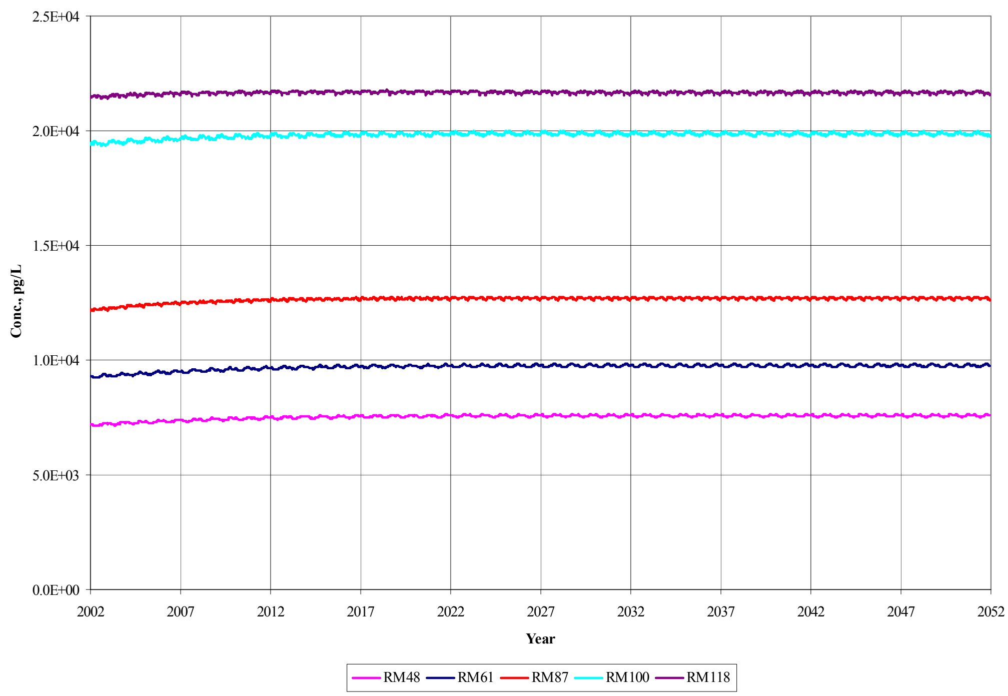

Figure 20: Temporal plot of penta-PCB concentrations in surface sediment layer during a 100 year simulation using the loads established in Step 2.

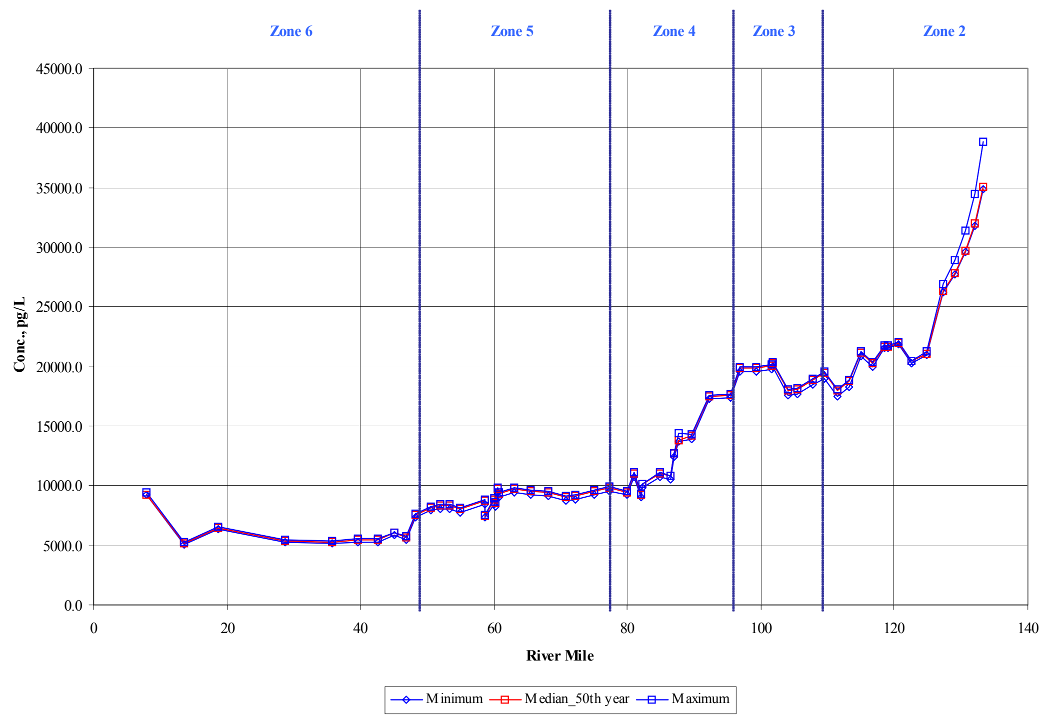

Figure 21: Spatial plot of simulated surface sediment concentrations of penta-PCBs in surface sediment layer during a 50 year simulation using the loads established in Step 2.

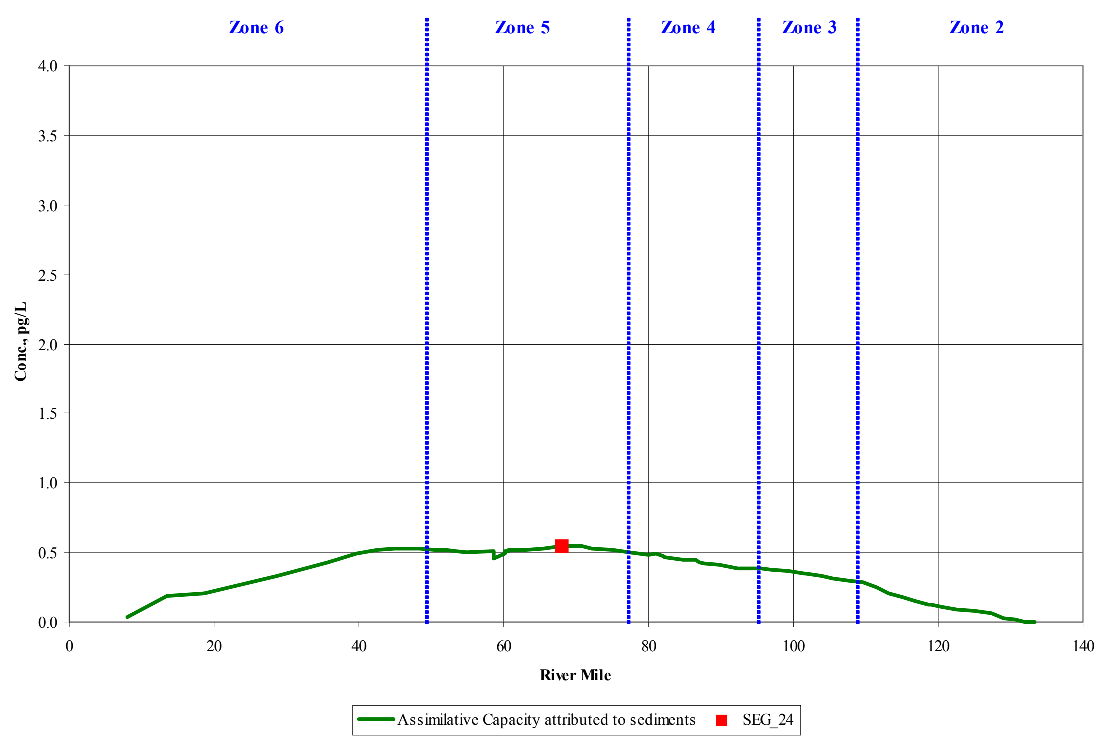

Figure 22: Spatial plot of the assimilative capacity in pg/L provided by the sediment layer.

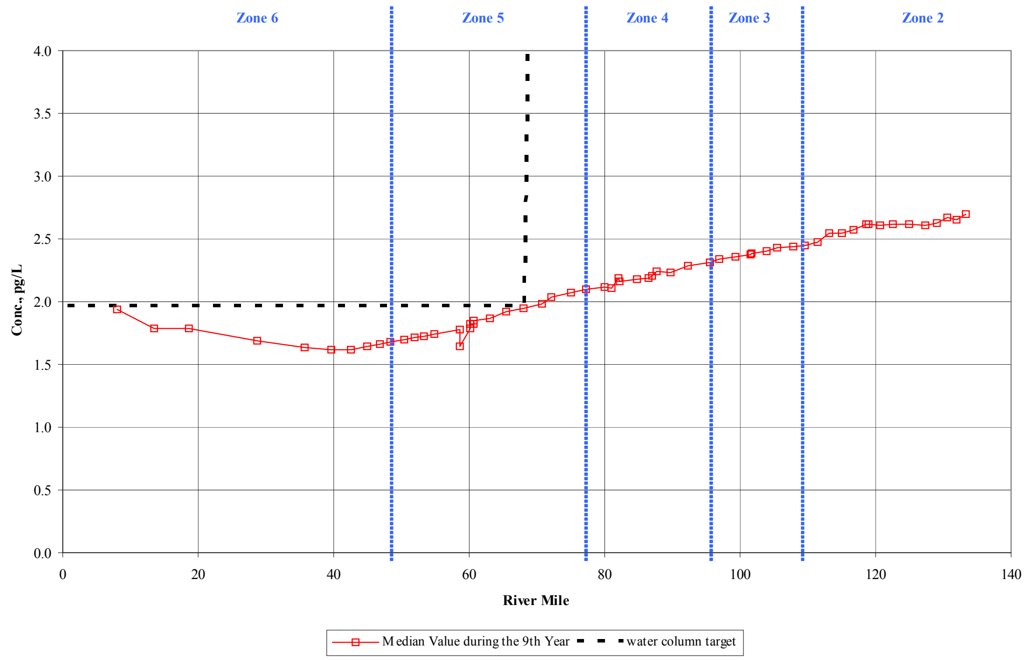

Figure 23: Spatial plot of the penta-PCBs in the water column during a 10 year simulation using the loads established in Step 2 and with new sediment initial conditions.

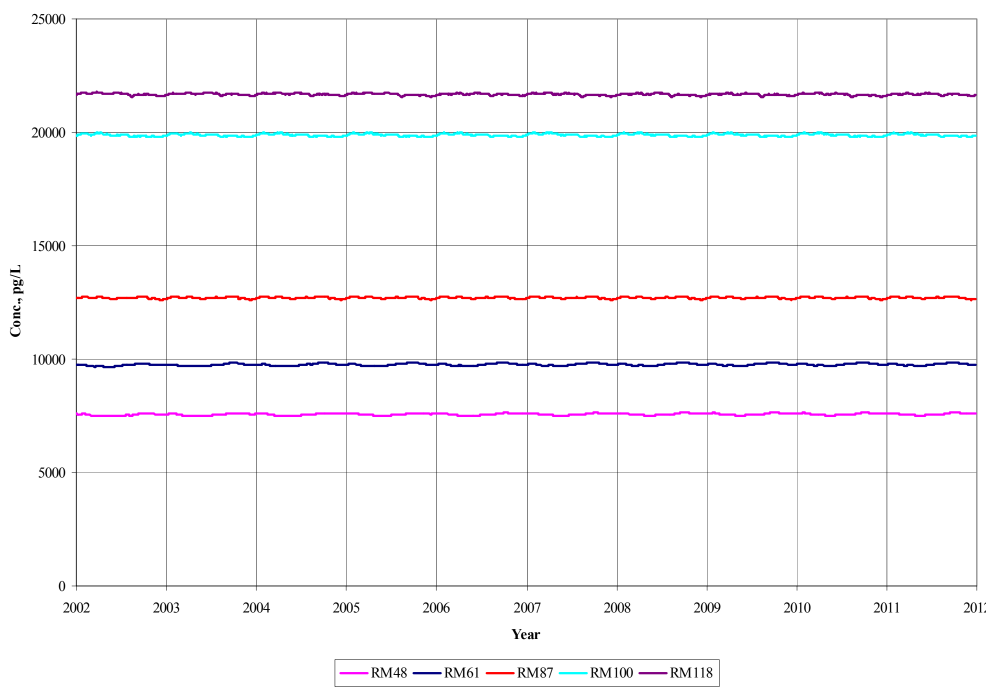

Figure 24: Temporal plot of the concentration of penta-PCBs in the surface sediment layer during a 10 year simulation using the loads established in Step 2 and with new sediment initial conditions.

3.3.5 Step 4

The final step in developing TMDLs for penta-PCBs for Zones 2 through 5 of the Delaware Estuary is to include the exchange of penta-PCBs between the gas phase in the atmosphere and truly dissolved penta-PCBs in the water. In the current model framework, the gas phase air concentrations are assigned, and are not dynamically simulated by the model. However, when the TMDL is achieved there should be close to zero net exchange between the water and air. It was therefore necessary to estimate the gas phase concentration that would be in equilibrium with the water quality targets (Figure 8) and then confirm that the water quality targets are still being met.

The penta-PCB water quality model utilizes the following formula to determine the volatilization rate of a chemical:

$$\frac{\partial C}{\partial t} = \frac{K_V}{D}\left[C_W - \frac{C_A}{H/RT_K}\right]$$

where: K_V = the transfer rate, meters per day
D = model segment depth in meters
C_W = truly dissolved fraction of the chemical in water, mg/L
C_A = atmospheric gas phase concentration, mg/L
H = Henry's Law Constant, atm-m^3/day
R = universal gas constant
T_K = water temperature in degrees Kelvin

At equilibrium, the volatilization rate will be zero. Therefore:

$$\left[C_W - \frac{C_A}{H/RT_K}\right] = 0$$

Rearranging this formula to calculate the atmospheric gas phase concentration for penta-PCBs:

$$C_W \times H/RT_K = C_A$$

Figure 25 presents the truly dissolved penta-PCB water concentrations predicted by the model from Step 4 and the corresponding equilibrium air concentrations of gaseous phase penta-PCBs for the one year cycling period.

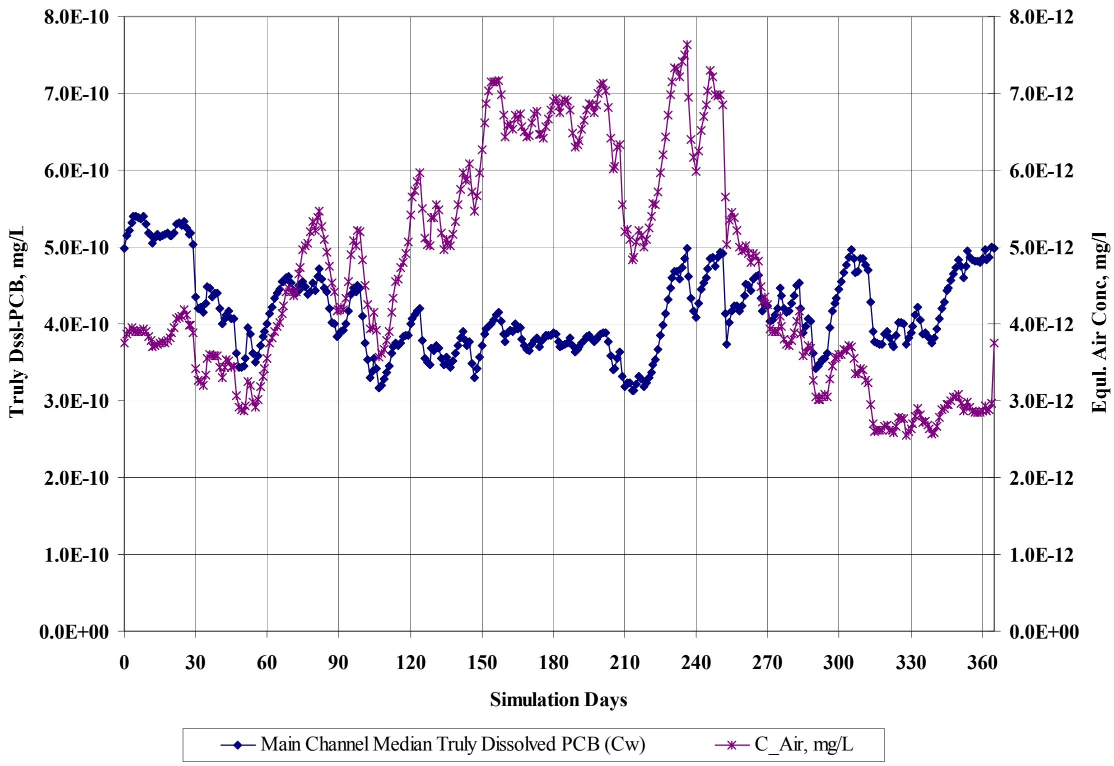

Figure 25: Back-calculated, equilibrium, median, gas phase penta-PCB concentrations during the one year model cycling period.

The penta-PCB water quality model is then run with the conditions obtained from Step 2 and 3 including the loadings from the model boundaries and to each estuary zone, initial penta-PCB concentrations in the sediment (Figure 24), and with back-calculated, equilibrium, median, gas phase penta-PCB concentrations during the one year model cycling period (Figure 25). The purpose of this simulation is to confirm that the penta-PCB concentrations in the sediments and the penta-PCB gas phase air concentrations are in equilibrium with the estuary concentrations that will meet the water quality target of 1.975 pg/L at the critical location when all fate processes are enabled in the model. These simulations were also run for 100 years to establish the point at which equilibrium was reached between the water column and the sediments. Figure 26 indicates the sediment concentration of penta-PCBs at five locations in the estuary corresponding to a model segment in each of the estuary zones and Delaware Bay. Note that sediment concentrations in all segments reach equilibrium after approximately 20 years. The simulated sediment concentrations at each of the model segments is presented in Figure 27. Figure 28 presents a plot of the annual median values during the 99^{th} and 100^{th} year of the simulation, confirming that the water quality target is being met.

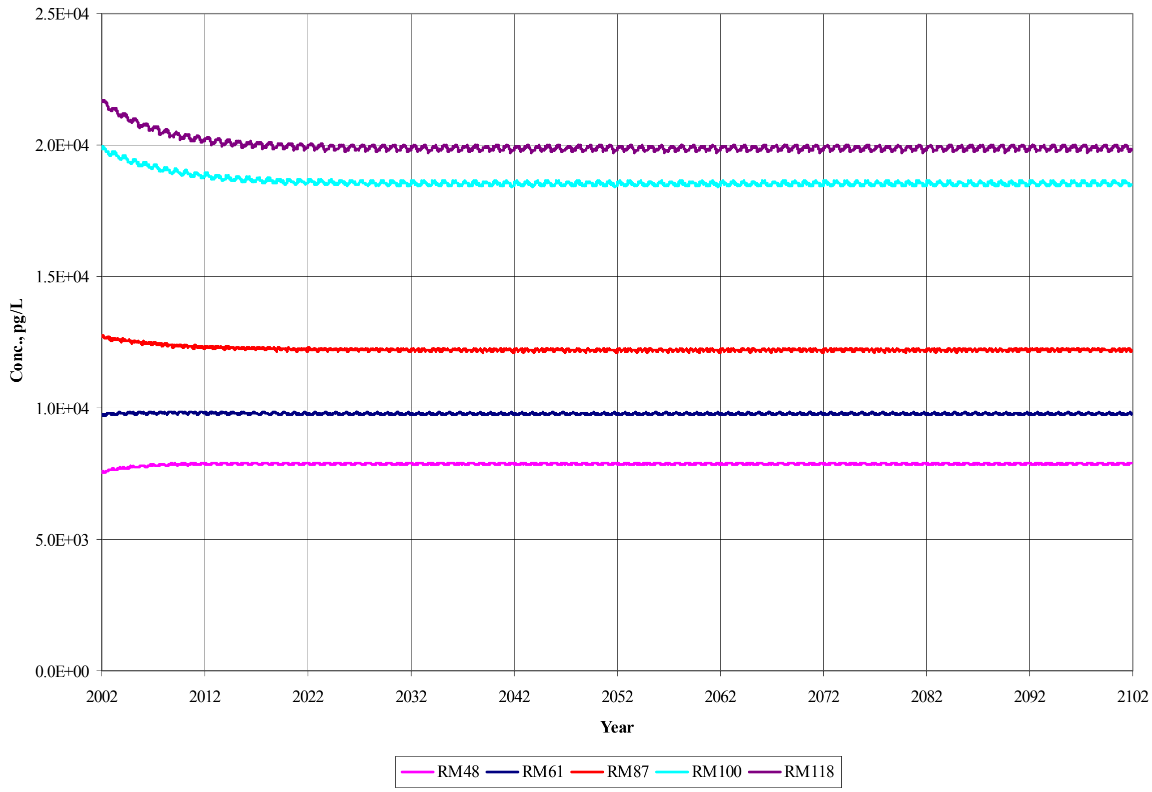

Figure 26: Temporal plot of penta-PCB concentrations in the surface sediment layer during a 100 year simulation with air-water exchange processes enabled.

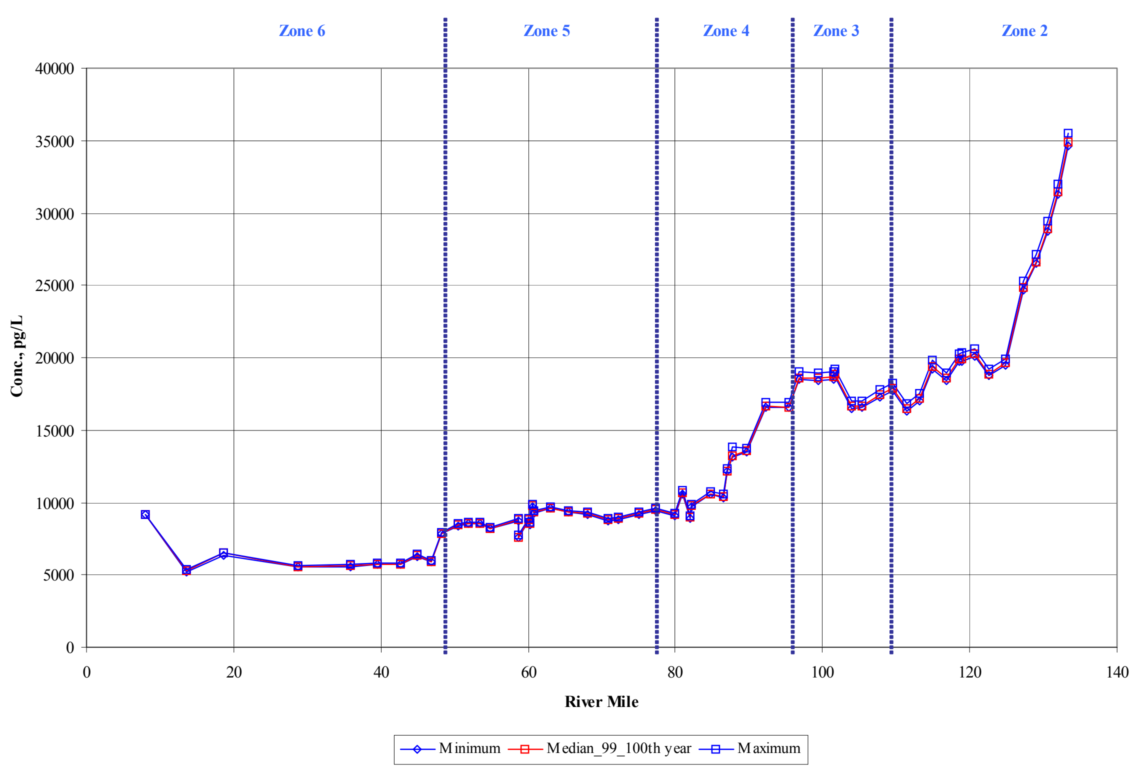

Figure 27: Spatial plot of penta-PCB concentrations in the surface sediment layer during a 100 year simulation with air-water exchange processes.

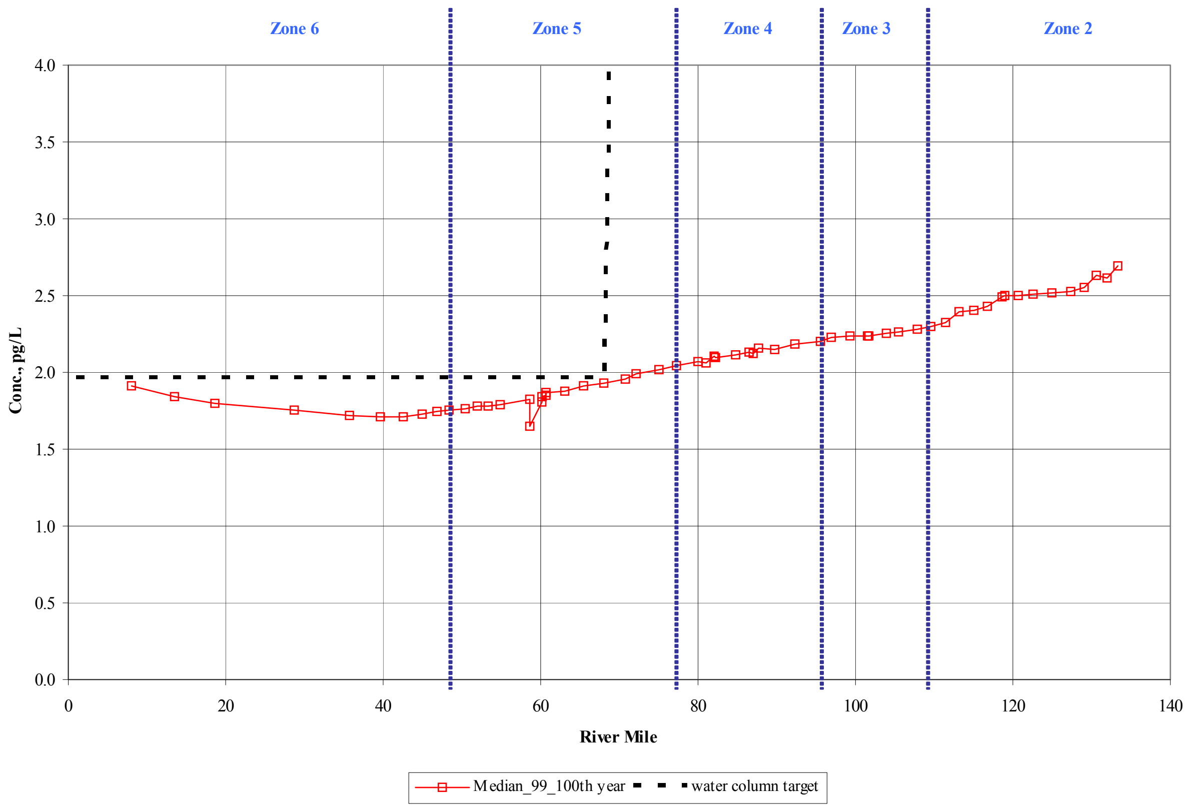

Figure 28: Spatial plot of the penta-PCBs in the water column during a 100 year simulation using the loads established in Step 2, new sediment initial conditions, and with air-water exchange processes enabled

4. TMDLs, WLAs and LAs for Total PCBs for Zones 2 to 5

4.1 TMDLs, WLAs and LAs for Penta- PCBs

Table 5 summarizes the calculated TMDLs (allowable loadings) for penta-PCBs for Zones 2 to 5 of the Delaware Estuary that were derived in Section 3.3.5. The loadings from the Delaware River at Trenton and the Schuylkill River are included in the Zone 2 and 4 TMDLs, respectively. The next step is to allocate the zone-specific TMDLs to a wasteload allocation portion or WLA, a load allocation portion or LA, and a margin of safety.

Table 5: TMDLs for penta-PCBs for Zones 2 through 5 of the Delaware Estuary

Estuary Zone	TMDL (milligrams / day)
Zone 2	**64.3400**
Zone 3	**4.4555**
Zone 4	**14.1779**
Zone 5	**12.0157**
Sum	**94.9891**

The Commission's Toxics Advisory Committee has made several recommendations on the policies and procedures to be used to establish these allocations. Federal regulations at 40 CFR Part 130.7(c)(1) require a margin of safety or MOS to be included in a TMDL to account for any lack of knowledge concerning the relationships between pollutant loadings and receiving water quality. Commission regulations also require that a portion of the TMDL be set aside as a margin of safety, with the proportion reflecting the degree of uncertainty in the data and resulting water quality-based controls. The margin of safety can be incorporated either implicitly in the design conditions used in establishing the TMDLs or explicitly by assigning a proportion of each TMDL. Both of these approaches were considered by the Toxics Advisory Committee who recommended that an explicit margin of safety of 5% be assigned in allocating the zone-specific TMDLs. This recommendation was based upon the use of a one year cycling period for the hydrodynamic and water quality model that mimics the period of record for the two major tributaries to the estuary rather than design tributary flows; and the use of tide data, precipitation data and the actual effluent flows that occurred during the one year cycling period. EPA finds these recommendations reasonable and supported by the evidence, and adopted them in these TMDLs. Table 6 presents the MOS allocation for each of the zones as well as the two tributary boundaries. This is necessary since the loadings from these tributaries are part of the PCB loadings to Zones 2 and 4

Table 6: Allocation of the Zone TMDLs to the 5% Margin of Safety

Sources of Loadings	Contribution Factor (CF)	TMDL	MOS	TMDL - MOS
	[pg/L] / [pg/L] or [pg/L] / [100mg/day]	mg/day	mg/day	mg/day
Delaware River	0.581500	57.727	2.886	54.841
Schuylkill River	0.118390	9.609	0.48	9.129
Zone 2	1.966800	6.613	0.331	6.282
Zone 3	2.142800	4.455	0.223	4.232
Zone 4	2.281300	4.569	0.228	4.341
Zone 5	0.967040	12.016	0.601	11.415
Sum		**94.989**	**4.749**	**90.24**

The committee recommended that for the Stage 1 TMDLs, the proportion of the TMDLS that are allocated to WLAs and LAs should be based upon the current loadings from the various PCB source categories to each of the zones during the one year cycling period (February 1, 2002 to January 31, 2003) used in the TMDL model simulations. EPA finds these recommendations reasonable and adopted them in these TMDLs.

Prior to allocation of the remaining portion of the TMDL between WLA and LA, the portion of the assimilative capacity allocated to contaminated sites was determined since the assimilative capacity for this source must also be shared between the estuary zones and the two boundary tributaries (see Section 3.2.1). Table 7 presents the load allocated to the contaminated sites by source and the remaining assimilative capacity that must still be allocated.

Table 7: Allocation of the Zone TMDLs to Contaminated Sites

Sources of Loadings	TMDL - MOS	% of Total Loading to Zone	Contaminated Site Allocation	TMDL - MOS - CS
	mg/day		mg/day	
Delaware River	54.841	-	0.229	54.612
Schuylkill River	9.129	-	3.473	5.656
Zone 2	6.282	0.42	0.026	6.256
Zone 3	4.233	57.09	2.416	1.816
Zone 4	4.340	38.04	1.651	2.689
Zone 5	11.415	46	5.251	6.164
	94.989	**-**	**13.046**	**77.193**

The remaining assimilative capacity can now be apportioned to WLAs and the rest of the sources that contribute to the LAs (Table 8). The WLA source categories include the continuous point source NPDES discharges, stormwater discharges permitted under the NPDES program, and combined sewer overflows (CSOs), and municipal separate storm sewer systems (MS4s).

EPA's regulations require NPDES-regulated storm water discharges to be addressed by the WLA component of a TMDL. Assessing the estimated loading from such discharges is relatively difficult compared to traditional point source discharges, as storm water discharge is typically calculated by quantifying the area of urban and residential land uses in a basin. For this reason, it is important to have updated land use data and runoff coefficients.

In developing the Stage 1 TMDLs, the existing WLAs were calculated for traditional point source discharges based on effluent concentrations and the actual effluent flows during the one year model cycling period (see Section 3.2.4.1). A November 22, 2002 EPA Memorandum entitled, "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm water Source and NPDES Permit Requirements Based on Those WLAs" clarified existing regulatory requirements for municipal separate storm sewer systems (MS4s) connected with TMDLs. Where a TMDL has been developed, the MS4 community must receive a WLA rather than a LA. The Stage 1 TMDL explicitly assigns a portion of each of the zone WLAs to storm water discharges that do not have an individual NPDES permit. Appendix 6 presents the procedure used to develop each of these zone allocations to MS4s and the resulting MS4 loading in milligrams per day (mg/day).

The LA source categories also include the other smaller tributaries, non-point source loads not permitted under the NPDES program, dry and wet atmospheric deposition. Tables 9 and 10 summarize the categories included in the aggregate allocations to WLAs and LAs in each zone, respectively. Table 11 summarizes the allocations to WLAs, LAs and the MOS. Figures 29 to 32 graphically illustrate the proportion allocated.

Table 8: Summary of Zone TMDLs for penta-PCBs and the allocation to the major source categories for PCBs.
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Sources of Loadings	Contribution Factor (CF)	TMDL	MOS	Contaminated Site Allocation	Remaining Allocation	Allocation to Continuous Point Sources	Allocation to CSOs	Allocation to MS4s	Remaining Portion to the rest of LAs
	[pg/L] / [pg/L] or [pg/L] / [100mg/day]	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day
Trenton	0.581500	57.727	2.886	0.229	54.611	0.000			
Schuylkill	0.118390	9.609	0.480	3.473	5.656	0.000			
Zone 2	1.966800	6.613	0.331	0.026	6.256	1.241	0.006	1.511	3.498
Zone 3	2.142800	4.455	0.223	2.416	1.816	0.771	0.462	0.185	0.398
Zone 4	2.281300	4.569	0.228	1.651	2.689	0.614	0.677	0.342	1.055
Zone 5	0.967040	12.016	0.601	5.250	6.165	3.132	0.182	0.592	2.259
Sum		94.989	4.749	13.046	77.193	5.758	1.327	2.630	7.211

Table 9: Summary of the Zone WLAs for penta-PCBs and their allocation to source categories.

Estuary Zone	WLA	NPDES continuous discharging point sources	CSOs	Municipal separate stormwater sewer service
	mg/day	mg/day	mg/day	mg/day
Zone 2	2.7574	1.2408	0.0059	1.5107
Zone 3	1.4180	0.7713	0.4620	0.1847
Zone 4	1.6338	0.6143	0.6772	0.3423
Zone 5	3.9062	3.1319	0.1822	0.5922
Sum	9.7155	5.7583	1.3272	2.6300

Table 10: Summary of the Zone LAs for penta-PCBs and their allocation to source categories.

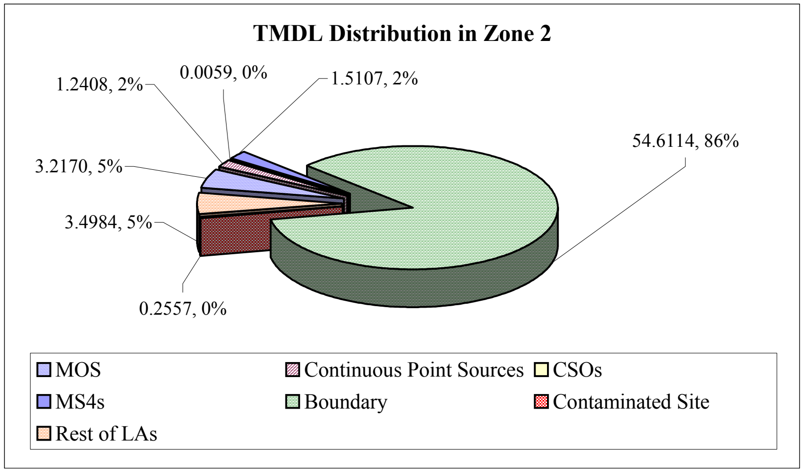
Estuary Zone	LAs	Boundary *	Contaminated Site	Others
	mg/day	mg/day	mg/day	mg/day
Zone 2	58.3656	54.6114	0.2557	3.4984
Zone 3	2.8147	0.0000	2.4164	0.3983
Zone 4	11.8351	5.6558	5.1240	1.0554
Zone 5	7.5087	0.0000	5.2501	2.2586
Sum	80.5242	60.2672	13.0462	7.2107

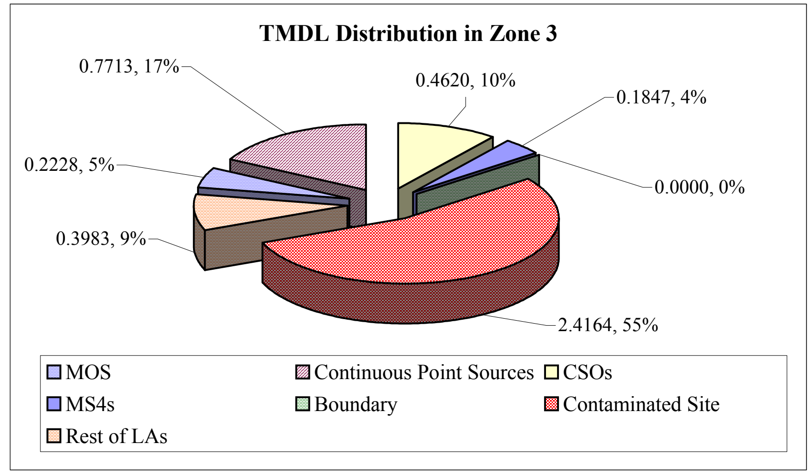
* - The boundary in Zone 2 is the Delaware River at Trenton, and the boundary in Zone 4 is the Schuylkill River.

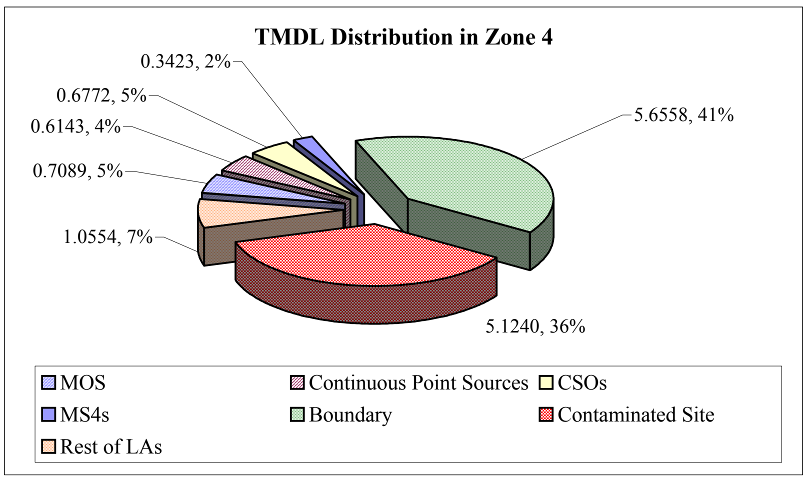
Table 11: Summary of the Zone TMDLs for penta-PCBs and their allocation to WLAs, LAs and a MOS.

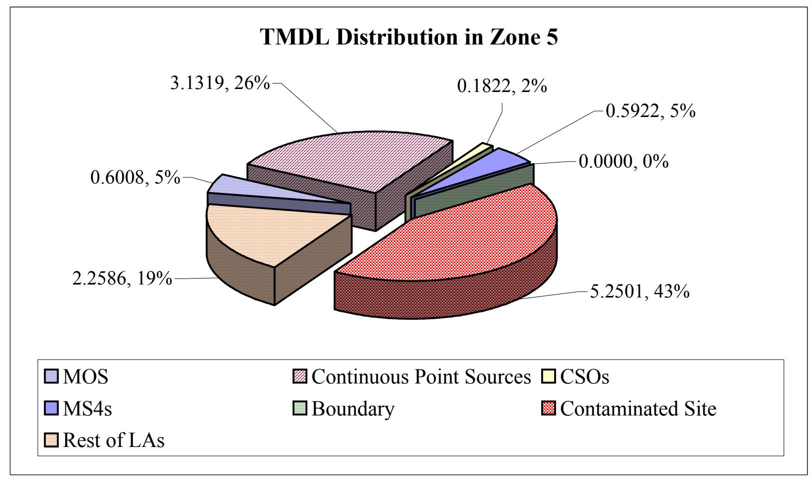
Estuary Zone	TMDL	WLA	LA	MOS
	mg/day	mg/day	mg/day	mg/day
Zone 2	64.3400	2.7574	58.3656	3.2170
Zone 3	4.4555	1.4180	2.8147	0.2228
Zone 4	14.1779	1.6338	11.8351	0.7089
Zone 5	12.0157	3.9062	7.5087	0.6008
Sum	94.9891	9.7155	80.5242	4.7495

Figures 29 - 32: Distribution of Zone TMDLs to Point sources and CSOs, and the Remainder of the Non-Point Sources (tributary boundary loads, the MOS and the Contaminated Site loading excluded).









4.2 TMDLs, WLAs and LAs for Total PCBs

4.2.1 Extrapolation from Penta to Total PCBs

As discussed in Sections 2.2 and 3.2.2, TMDLs for Total PCBs will be extrapolated from penta homolog data using the observed ratio in the Delaware Estuary of the penta homolog to total PCBs. This approach was recommended by the expert panel established by the Commission due to time limitations and the technical difficulty in developing and calibrating a PCB model for each of the ten PCB homologs. Data available to the panel at that time indicated that the proportion of penta-PCBs to Total PCBs at 15 locations sampled in the estuary ranged between 0.2 and 0.3 (20 to 30% of Total PCBs). Figure 33 presents the ratio of penta-PCBs to Total PCBs for each zone based upon data currently available. EPA finds this extrapolation to be reasonable and supported by the best available data.

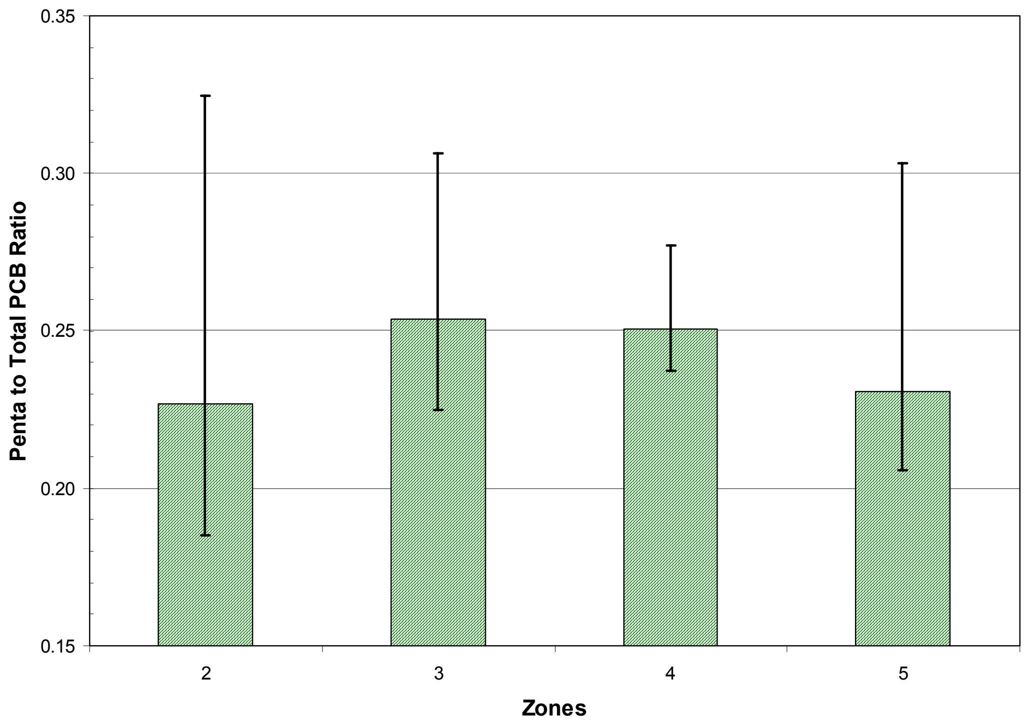


Figure 33: Ratio of Penta-PCBs to Total PCBs in ambient water samples collected from 15 sites in the Delaware Estuary during surveys conducted on September 18, 2001, March 15, 2002, April 11, 2002, October 8, 2002 and March19, 2003. Error bars indicate the minimum and maximum ratios observed at any sampling site during all five surveys.

This data supports the original data and indicates median penta- to total PCB ratios of 0.23, 0.25, 0.25 and 0.23 for Zones 2 to 5, respectively. For Stage 1 TMDLs, a fixed value of 0.25 was used for all zones to scale up the zone-specific TMDLs, WLAs, LAs and MOSs.

4.2.2 TMDLs, WLAs and LAs for Total PCBs

Table 12 summarizes the TMDLs for each estuary zone for total PCBs as well as the allocations to WLAs, LAs and the MOSs.

Table 12: TMDLs, WLAs, LAs and MOSs for Total PCBs for Zones 2 to 5 of the Delaware Estuary.

Estuary Zone	TMDL	WLA	LA	MOS
	mg/day	mg/day	mg/day	mg/day
Zone 2	257.36	11.03	233.46	12.87
Zone 3	17.82	5.67	11.26	0.89
Zone 4	56.71	6.54	47.34	2.84
Zone 5	48.06	15.63	30.04	2.40
Sum	379.96	38.86	322.10	19.00

4.2.3 Uncertainty Analysis for TMDLs, WLAs and LAs for Total PCBs

Uncertainty is associated with three elements of the Stage 1 TMDLs: 1) the use of annual median values for determining compliance with the penta-PCB water quality target, 2) the loading of penta-PCBs for each of the source categories that is used to apportion the TMDLs, and 3) the extrapolation of the penta-PCB TMDLs, aggregate and individual WLAs, and LAs to total PCBs.

As discussed in Section 3.2.1, TMDLs are calculated over a one year period (annual median) to be consistent with both the model simulations and the 70 year exposure used for human health criteria. The estuary, however, is dynamic with ambient PCB concentrations being affected by the amount of inflow from the tributaries, the variation in the tides over lunar and annual time scales, changes in both continuous and precipitation-induced wastewater flows, and the prevailing air and water temperature. Thus, ambient PCB concentrations will vary on both a daily and monthly basis about the annual median. The magnitude of this variation can be seen by plotting the annual minimum and annual maximum values that occur during long-term model simulations like those used to check whether a given set of loading assumptions results in compliance with the penta-PCB water quality target at the critical location (see Figure 28). Figure 34 illustrates the uncertainty associated with the use of annual median values by comparing annual minimum and maximum plots of water column concentrations of penta-PCBs during a 100 year simulation. The figure indicates that the annual variation is approximately +15% to -25%.

The uncertainty in the loading estimates for each of the source categories is discussed in Section 2.7 of the model calibration report (DRBC, 2003c). A Monte Carlo analysis was performed to examine and compare the uncertainty for the loading estimates for each PCB source category that were used in the 577 day model calibration period. This analysis indicated that the greatest uncertainty was associated with the tidal non-point source loads (90th and 10th percentiles of loading were 44.82 and 2.28 kilograms, respectively) followed by the contaminated site loads (90th and 10th percentiles of loading were 24.94 and 4.23 kilograms, respectively). Less uncertainty was associated with the loading from point sources (90th and 10th percentiles of loading were 8.53 and 5.16 kilograms, respectively)

The uncertainty in the extrapolation from penta-PCBs to total PCBs is illustrated in Figure 33. This figure indicates that while the zone ratios of penta-PCBs to total PCBs is close to 0.25, the uncertainty associated with the ratios varies between zones with the largest uncertainty occurring in Zone 2 (0.19 to 0.32) and the smallest occurring in Zone 4 (0.24 to 0.28).

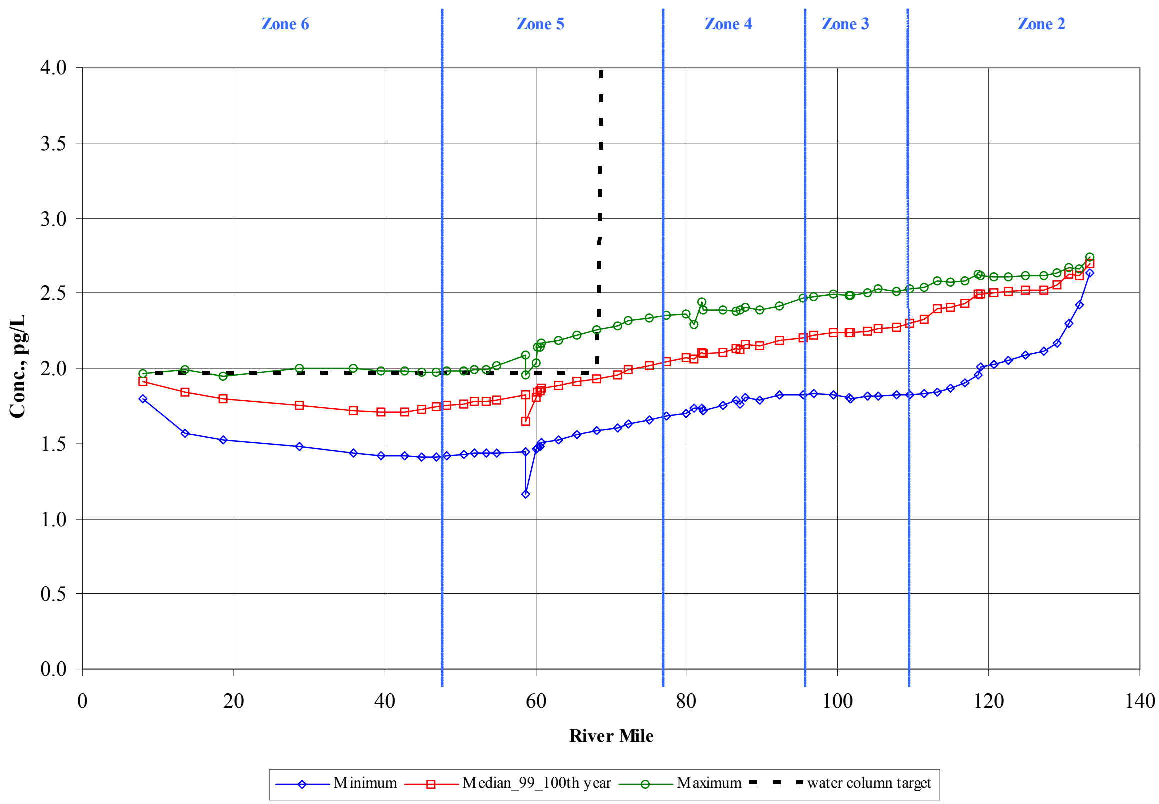


Figure 34: Spatial plots of the annual median, annual minimum and annual maximum values of water column penta-PCB concentrations during a 100 year simulation using the TMDL loads.

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Appendix 1

REDUCING PCB LOADINGS TO THE DELAWARE ESTUARY:
A Staged Approach to Establishing TMDLs

Documents distributed at the April 29, 2003 meeting convened by the

U.S. Environmental Protection Agency, Regions II and III

Delaware River Basin Commission

Delaware Department of Natural Resources & Environmental Control

New Jersey Department of Environmental Protection

Pennsylvania Department of Environmental Protection

Appendix 2

Individual Wasteload Allocations for NPDES Discharges: Stage 1 TMDLs for Total PCBs for Zones 2 to 5 of the Delaware Estuary

Appendix Table 2-1: Individual wasteload allocations for the point source discharges except CSOs and MS4s.

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
1	1	Morrisville WWTP	PA0026701	001	2	132.9	76	2	65.566	0.057280	0.229120
2	2	Trenton	NJ0020923	001	2	132.2	75	1	243.612	0.212825	0.851301
3	3	PSEG-Mercer	NJ0004995	441A	2	130.4	74	2	0.000	0.000000	0.000000
4	4	PSEG-Mercer	NJ0004995	441C	2	130.4	74	1	5.010	0.004377	0.017508
5	5	MSC Pre Finish Metals	PA0045021	001	2	130.1	74	2	0.646	0.000564	0.002256
6	6	Hamilton Township	NJ0026301	001	2	128.0	73	2	220.791	0.192889	0.771555
7	7	Yates Foil	NJ0004332	001B	2	128.0	73	2	0.070	0.000061	0.000244
8	8	Yates Foil	NJ0004332	002A	2	128.0	73	2	0.000	0.000000	0.000000
9	9	Bordentown Sewerage Authority	NJ0024678	001	2	128.0	71	2	26.292	0.022969	0.091877
10	10	U.S. Steel	PA0013463	002	2	127.4	71	1	61.390	0.053632	0.214527
11	11	U.S. Steel	PA0013463	103	2	127.0	71	1	10.056	0.008785	0.035141
12	12	U.S. Steel	PA0013463	203	2	127.0	71	1	3.787	0.003308	0.013234
13	13	Exelon-Fairless	PA0057088	001	2	126.6	71	2	0.000	0.000000	0.000000
14	14	Waste Management Grows Landfill	PA0043818	001	2	125.5	70	2	1.182	0.001033	0.004131
15	15	Lower Bucks County Municipal Authority	PA0026468	001	2	121.9	69	2	129.179	0.112854	0.451417
16	16	Florence Township	NJ0023701	001	2	121.4	68	2	15.682	0.013700	0.054802
17	17	GEON Company (Burlington) Polyone	NJ0004235	001A	2	120.3	68	2	15.051	0.013149	0.052595
18	18	Bristol Borough	PA0027294	001	2	118.7	66	2	29.383	0.025669	0.102677
19	19	US Pipe & Foundry	NJ0005266	002A	2	118.1	66	1	0.807	0.000705	0.002821
20	20	City of Burlington	NJ0024660	002	2	117.6	64	2	46.336	0.040480	0.161921
21	21	PSEG-Burlington	NJ0005002	WTPA	2	117.4	64	1	0.929	0.000812	0.003246
22	22	Rohm&Haas-Bristol	PA0012769	009	2	117.1	64	1	5.710	0.004988	0.019952

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
23	23	Burlington Township	NJ0021709	001	2	117.0	64	2	34.901	0.030490	0.121961
24	24	Colorite Polymers	NJ0004391	002A	2	117.0	64	2	0.008	0.000007	0.000030
25	25	Colorite Polymers	NJ0004391	003A	2	117.0	64	2	0.740	0.000646	0.002585
26	26	Bristol Township	PA0026450	001	2	116.8	64	2	34.732	0.030342	0.121370
27	27	Beverly Sewerage Authority	NJ0027481	001	2	114.7	63	1	18.890	0.016503	0.066010
28	28	Delran Sewerage Authority	NJ0023507	001	2	110.8	60	2	37.419	0.032691	0.130762
29	29	Mt. Holly Municipal Utilities Authority	NJ0024015	001	2	110.8	61	2	54.904	0.047965	0.191862
30	30	Mt. Laurel Municipal Utilities Authority	NJ0025178	001A	2	110.8	60	2	67.433	0.058911	0.235646
31	31	Riverton Borough	NJ0021610	001	2	110.8	61	1	3.853	0.003366	0.013464
32	32	Willingboro Municipal Utilities Authority	NJ0023361	001	2	110.8	61	2	123.392	0.107798	0.431194
33	33	AFG Industries	NJ0033022	001A	2	109.6	59	1	10.258	0.008962	0.035848
34	34	AFG Industries	NJ0033022	002	2	109.4	59	2	0.092	0.000080	0.000321
35	35	Hoeganaes Corp.	NJ0004375	001A	2	109.4	59	2	0.330	0.000288	0.001151
36	36	Hoeganaes Corp.	NJ0004375	003A	2	109.4	59	2	0.000	0.000000	0.000000
37	37	Cinnaminson Sewerage Authority	NJ0024007	001	2	108.9	59	1	27.980	0.024444	0.097778
38	38	Riverside Sewerage Authority	NJ0022519	001	2	108.8	59	1	124.107	0.108423	0.433693
39	1	Palmyra Borough	NJ0024449	001	3	107.7	58	2	19.235	0.005384	0.021536
40	2	Rohm&Haas-Philadelphia	PA0012777	001	3	106.1	56	2	15.974	0.004471	0.017885
41	3	Rohm&Haas-Philadelphia	PA0012777	003	3	106.1	56	1	2.175	0.000609	0.002435
42	4	Rohm&Haas-Philadelphia	PA0012777	007	3	106.1	56	2	0.003	0.000001	0.000003
43	5	NGC Industries	NJ0004669	001A	3	104.4	55	2	1.528	0.000428	0.001710
44	6	PWD-NE	PA0026689	001	3	104.1	55	1	1238.662	0.346711	1.386845
45	7	Citgo Petroleum	NJ0131342	001A	3	103.4	55	2	0.012	0.000003	0.000014
46	8	Exelon-Delaware	PA0011622	001	3	101.2	52	2	0.044	0.000012	0.000049

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
47	9	Exelon-Delaware	PA0011622	002	3	101.2	52	1	0.655	0.000183	0.000733
48	10	Exelon-Delaware	PA0011622	004	3	101.2	52	2	0.011	0.000003	0.000013
49	11	Exelon-Delaware	PA0011622	006	3	101.1	52	2	0.000	0.000000	0.000000
50	12	CCMUA	NJ0026182	001	3	98.0	49	1	818.459	0.229093	0.916372
51	13	PWD-SE	PA0026662	001	3	96.8	49	1	657.721	0.184101	0.736405
52	1	Coastal Mart / Coastal Eagle Point Oil	NJ0005401	003A	4	94.7	48	2	0.006	0.000002	0.000007
53	2	Coastal Mart / Coastal Eagle Point Oil	NJ0005401	001A	4	94.3	48	2	55.368	0.014863	0.059451
54	3	Metro Machine	PA0057479	DD2	4	93.2	44	1	49.040	0.013164	0.052656
55	4	Metro Machine	PA0057479	DD3	4	93.1	44	2	17.845	0.004790	0.019161
56	5	Kvaerner	PA0057690	019	4	92.8	44	1	0.100	0.000027	0.000108
57	6	Kvaerner	PA0057690	021	4	92.8	44	1	0.100	0.000027	0.000108
58	7	Kvaerner	PA0057690	012	4	92.7	44	1	22.608	0.006069	0.024275
59	8	Kvaerner	PA0057690	047	4	92.5	45	2	0.005	0.000001	0.000005
60	9	Sunoco-GirardPoint	PA0011533	015	4	92.5	45	2	99.167	0.026620	0.106481
61	10	Sunoco-PointBreeze	PA0012629	002	4	92.5	46	2	75.899	0.020374	0.081496
62	11	PWD-SW	PA0026671	001	4	90.7	43	1	1020.466	0.273932	1.095729
63	12	Ausimont	NJ0005185	001A	4	90.7	43	1	0.840	0.000225	0.000902
64	13	Ausimont	NJ0005185	002A	4	90.7	43	1	0.077	0.000021	0.000082
65	14	Chevron	NJ0064696	001A	4	90.5	43	2	0.157	0.000042	0.000169
66	15	Colonial Pipeline	NJ0033952	001A	4	90.5	43	2	0.087	0.000023	0.000094
67	16	BP Paulsboro	NJ0005584	002A	4	89.6	43	2	0.352	0.000095	0.000378
68	17	BP Paulsboro	NJ0005584	003A	4	89.4	43	2	7.006	0.001881	0.007522
69	18	GCUA	NJ0024686	001	4	88.4	43	1	113.497	0.030467	0.121868
70	19	Air Products	NJ0004278	001A	4	88.2	42	2	10.041	0.002695	0.010782

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
71	20	Valero Refining	NJ0005029	001A	4	87.7	42	1	99.473	0.026702	0.106809
72	21	Hercules	NJ0005134	001A	4	87.5	42	1	4.120	0.001106	0.004424
73	22	Greenwich Township	NJ0030333	001	4	87.0	42	2	12.110	0.003251	0.013003
74	23	Dupont-Repauno	NJ0004219	007	4	86.6	42	1	1.433	0.000385	0.001538
75	24	Dupont-Repauno	NJ0004219	001A	4	85.6	38	1	80.773	0.021682	0.086730
76	25	Boeing	PA0013323	002	4	85.4	38	1	158.353	0.042508	0.170032
77	26	Boeing	PA0013323	016	4	85.4	38	1	0.149	0.000040	0.000160
78	27	Tinicum Township	PA0028380	001	4	85.4	40	1	15.450	0.004147	0.016590
79	28	Boeing	PA0013323	001	4	85.2	38	1	29.068	0.007803	0.031212
80	29	Boeing	PA0013323	003	4	85.2	38	1	0.404	0.000108	0.000433
81	30	Boeing	PA0013323	007	4	85.2	38	1	0.235	0.000063	0.000252
82	31	Boeing	PA0013323	008	4	85.2	38	2	0.018	0.000005	0.000019
83	32	Exelon-Eddystone	PA0013716	001	4	85.2	38	1	0.064	0.000017	0.000069
84	33	Exelon-Eddystone	PA0013716	005	4	85.2	38	1	0.509	0.000137	0.000546
85	34	Exelon-Eddystone	PA0013716	007	4	85.2	38	2	0.000	0.000000	0.000000
86	35	Exelon-Eddystone	PA0013716	008	4	85.2	38	2	0.000	0.000000	0.000000
87	36	Kimberly Clark	PA0013081	029	4	83.2	36	1	0.086	0.000023	0.000092
88	37	DeGuessa-Huls Corp.	PA0051713	001	4	82.2	36	2	9.063	0.002433	0.009731
89	38	DELCORA	PA0027103	001	4	80.6	34	1	309.423	0.083061	0.332244
90	39	ConocoPhillips	PA0012637	002	4	80.2	34	2	0.000	0.000000	0.000000
91	40	ConocoPhillips	PA0012637	006	4	80.2	34	2	0.029	0.000008	0.000032
92	41	ConocoPhillips	PA0012637	007	4	80.2	34	1	0.511	0.000137	0.000549
93	42	ConocoPhillips	PA0012637	008	4	80.2	34	1	0.111	0.000030	0.000119
94	43	Harrison Township-Mullica Hill	NJ0020532	001	4	79.8	79	2	6.093	0.001636	0.006543

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
95	44	Safety Kleen	NJ0005240	001A	4	79.8	79	2	7.440	0.001997	0.007989
96	45	Safety Kleen	NJ0005240	002A	4	79.8	79	1	3.512	0.000943	0.003772
97	46	Swedesboro	NJ0022021	001	4	79.8	79	2	3.296	0.000885	0.003539
98	47	ConocoPhillips	PA0012637	101	4	79.6	34	2	0.000	0.000000	0.000000
99	48	ConocoPhillips	PA0012637	201	4	79.6	34	2	48.580	0.013041	0.052163
100	49	Logan Township	NJ0027545	001	4	79.5	34	2	12.114	0.003252	0.013007
101	50	Solutia	NJ0005045	001	4	79.2	34	2	12.228	0.003282	0.013130
102	1	General Chemical	DE0000655	001	5	77.9	33	2	0.000	0.000000	0.000000
103	2	Geon Company (Pedricktown) Polyone	NJ0004286	003	5	75.9	32	2	0.011	0.000007	0.000030
104	3	Geon Company (Pedricktown) Polyone	NJ0004286	001A	5	74.9	32	2	1.690	0.001135	0.004542
105	4	Dupont-Edgemoor	DE0000051	001	5	73.2	31	1	32.214	0.021641	0.086564
106	5	Dupont-Edgemoor	DE0000051	004	5	72.2	31	1	0.153	0.000103	0.000412
107	6	Conectiv-Edgemoor	DE0000558	041	5	71.8	31	2	0.008	0.000005	0.000020
108	7	City of Wilmington	DE0020320	001	5	71.6	31	2	1297.745	0.871802	3.487207
109	8	Carney's Point	NJ0021601	001	5	71.3	25	2	10.265	0.006896	0.027584
110	9	AMTRAK	DE0050962	003	5	70.7	30	1	2.002	0.001345	0.005378
111	10	AMTRAK	DE0050962	004	5	70.7	30	1	35.822	0.024065	0.096259
112	11	Penns Grove Sewer Authority	NJ0024023	001	5	70.7	28	1	23.206	0.015589	0.062357
113	12	Dupont-ChamberWorks	NJ0005100	001A	5	69.8	25	1	138.476	0.093026	0.372103
114	13	Dupont-ChamberWorks	NJ0005100	662A	5	69.8	25	1	102.854	0.069096	0.276383
115	14	Conectiv-Deepwater	NJ0005363	003A	5	69.1	24	2	0.000	0.000000	0.000000
116	15	Conectiv-Deepwater	NJ0005363	005	5	69.1	24	2	0.035	0.000024	0.000094
117	16	Conectiv-Deepwater	NJ0005363	006	5	69.1	24	2	0.006	0.000004	0.000017
118	17	Conectiv-Deepwater	NJ0005363	017	5	69.1	24	1	0.284	0.000191	0.000763

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
119	18	Dupont-ChamberWorks	NJ0005100	011A	5	68.9	24	2	0.004	0.000003	0.000010
120	19	Dupont-ChamberWorks	NJ0005100	013A	5	68.9	24	2	0.000	0.000000	0.000000
121	20	Pennsville Sewerage Authority	NJ0021598	001	5	65.1	23	1	63.353	0.042559	0.170237
122	21	OxyChem	DE0050911	001	5	62.2	81	1	1.798	0.001208	0.004831
123	22	OxyChem	DE0050911	002	5	62.2	81	1	0.168	0.000113	0.000453
124	23	Conectiv-DelawareCity	DE0050601	016	5	61.9	22	2	0.123	0.000082	0.000330
125	24	Conectiv-DelawareCity	DE0050601	033	5	61.9	22	2	0.005	0.000003	0.000012
126	25	Conectiv-DelawareCity	DE0050601	034	5	61.9	22	2	0.015	0.000010	0.000040
127	26	Metachem	DE0020001	002	5	61.9	22	1	1.713	0.001151	0.004604
128	27	Metachem	DE0020001	003	5	61.9	22	1	2.176	0.001462	0.005848
129	28	Metachem	DE0020001	001	5	61.5	21	2	81.182	0.054537	0.218147
130	29	Motiva	DE0000256	001	5	61.5	21	2	0.000	0.000000	0.000000
131	30	Motiva	DE0000256	601	5	61.5	21	1	0.000	0.000000	0.000000
132	31	Kaneka Delaware Corp.	DE0000647	001	5	61.4	21	2	2.266	0.001522	0.006089
133	32	Formosa Plastics	DE0000612	001	5	61.3	21	2	4.885	0.003281	0.013126
134	33	Motiva	DE0000256	101	5	61.0	21	1	2843.225	1.910027	7.640108
135	34	Delaware City STP (New Castle Co.)	DE0021555	001	5	60.1	18	2	4.085	0.002744	0.010976
136	35	City of Salem	NJ0024856	001	5	58.8	15	2	10.062	0.006760	0.027038
137	36	Port Penn STP (New Castle Co.)	DE0021539	001	5	54.8	12	2	0.487	0.000327	0.001308
138	37	PSEG-HopeCreek	NJ0025411	461A	5	52.0	11	2	0.000	0.000000	0.000000
139	38	PSEG-HopeCreek	NJ0025411	461C	5	52.0	11	1	0.915	0.000614	0.002457
140	39	PSEG-HopeCreek	NJ0025413	462A	5	52.0	11	2	0.011	0.000007	0.000029
141	40	PSEG-Salem	NJ0005622	485	5	51.0	77	2	0.000	0.000000	0.000000
142	41	PSEG-Salem	NJ0005622	489	5	51.0	77	1	0.984	0.000661	0.002644

Appendix 3

Permit Implications for NPDES Dischargers resulting from Stage 1 TMDLs for PCBs

The staged approach to establishing TMDLs for PCBs for Zones 2 to 5 of the Delaware Estuary that was presented to interested parties in April 2003 by the regulatory agencies described appropriate NPDES permitting actions that would result following the establishment of the Stage 1 TMDLs by the U.S. Environmental Protection Agency. The criteria that were presented at that time utilized a cumulative loading approach to identify those discharges with the largest loading of penta-PCBs. The criteria have been expanded and refined since that time to include the quality of the penta-PCB data used to develop the loading estimates for the NPDES dischargers.

Approach:

NPDES dischargers (excluding CSOs and MS4s) were divided into two groups based upon the type of analytical method used to measure the 19 penta-PCB congeners, and the number of the penta-PCB congeners that were detected. Five criteria are considered in classifying NPDES point discharges into two groups.

The criteria for grouping the discharges is as follows:

1. Method used:
    a. 1668A
    b. 8082A

2. Discharge consists principally of non-contact cooling water.

3. If Method 1668A was used, the data was submitted at the detection limits specified in the method:
    a. Yes
    b. No

4. Average number of detected penta congeners per sampling event:
    a. 4 or greater
    b. Less than 4

5. Calculated loadings
    a. A discharge using Method 1668A with lower detection limits which is one of a group of discharges whose total cumulative loading is less than 10% of the zone waste load allocation.

<u>Group 1</u>

1. All discharges, except non-contact cooling water discharges, which have detected 4 or more penta PCB congeners per sampling event regardless of the method used and detection limits achieved, with the exception of those discharges using Method 1668A at the method specified detection limits whose cumulative loadings are less than the 10 percent of zone WLAs.

<u>Group 2</u>

1. All discharges with less than 4 congener detected per sampling event.
2. All discharges which have detected 4 or more penta PCB congeners per sampling event using Method 1668A at the method specified detection limits whose cumulative loadings are less than the 10 percent of zone WLAs.
3. All non-contact cooling water, regardless of the number of penta congeners detected, method used, or detection limits.

Permit Requirements:

Federal regulations implementing the NPDES program at 40 CFR Part 122.44(k)(4) allow the use of non-numeric, Best Management Practices-based WQBELs where a BMP approach is the reasonably necessary means to control pollutants to achieve the goals of the Clean Water Act. The uncertainty associated with several elements of the current TMDL development process including the PCB loadings calculations, the model inputs, and the extrapolation from penta-PCBs to total PCBs support this approach for Stage 1. EPA recommends that the groups receive the following permit requirements consisten with state and federal NPDES permit regulations.

Group 1 - Permit requirements will include waste minimization and reduction programs and additional monitoring with Method 1668A. Both requirements will be performed concurrently, and will be imposed when permit is reissued or modified. DRBC may also impose the requirements.

Group 2 - Permit requirements will include waste minimization and reduction programs (WMRP) and additional monitoring with Method 1668A. Monitoring will be performed in the first two years to confirm the presence and concentration of PCB congeners followed by the WMRP in the third year if the monitoring results confirm the concentrations and associated loading estimates for penta-PCBs, or result in loading estimates for other PCB homologs that exceed the individual WLAs for total PCBs for the discharge.

It is recommended that both requirements will be imposed when permit is reissued or modified. DRBC may also impose the requirements for selected discharges (i.e., non-contact cooling water discharges).

Note: Dischargers in both Groups are receiving individual WLAs. Therefore, the sum of all individual WLAs plus the aggregate WLA for CSOs will equal the proportion of the TMDL for each zone that is allocated to WLAs (Zone WLA).

EPA specifically requested comment and additional information during the public comment period regarding the assignment of discharges to each group. Based upon the comments received, no changes to the group assignments were necessary. The draft TMDL document utilizes data from point discharges that were submitted by April 2003. Some dischargers utilized method 1668A for analysis, however the data reported did not adhere to method detection limits specified by the method. Therefore all dischargers which utilized method 1668A were required to re-submit data at the detection limits specified by the method. As of the April date, some dischargers had resubmitted the data , however, there remained a group of dischargers who did not provide the data by April 2003. Many of these dischargers have provided data since April and the resubmitted data has been used to generate revised loadings and number of penta congeners detected (Appendix Tables 3-2 to 3-5). The resubmitted data had essentially two effects. It typically increased the number of detected congeners and changed the loadings estimates for the discharges.

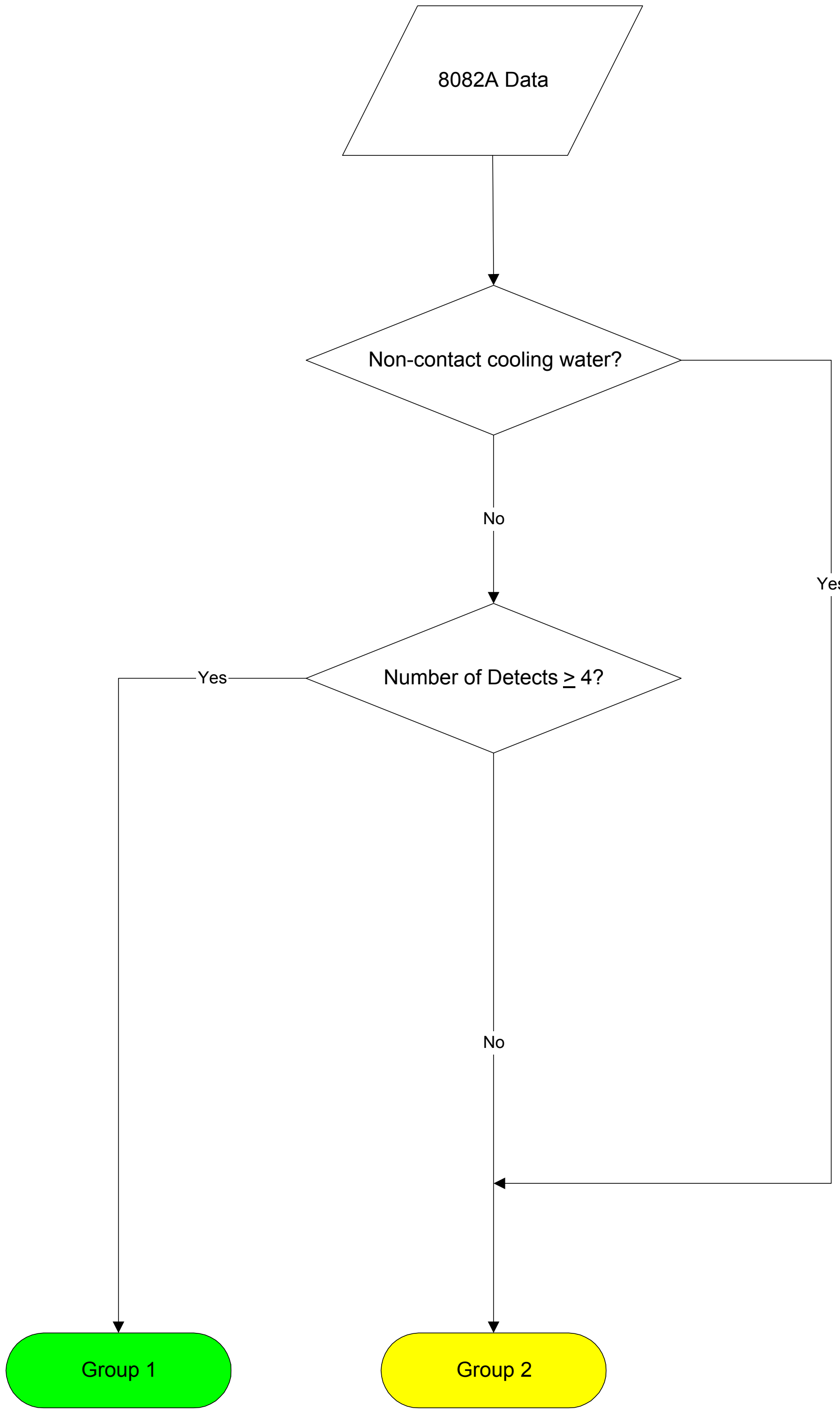
There are however, a small number of dischargers which utilized method 1668A for which we have not received resubmitted data as of September 11, 2003.

As indicated at that time, the identification of significant point source dischargers is a dynamic process that depends on several factors including the availability and extent of PCB congener data for each discharge, the flows used for each discharge, the procedure used to calculate the loadings, the location of the discharge in the estuary, and the proximity and loading of other sources of PCBs. As a result, the list of point source dischargers is subject to change both prior to December 2003 and during the development of the Stage 2 TMDLs.

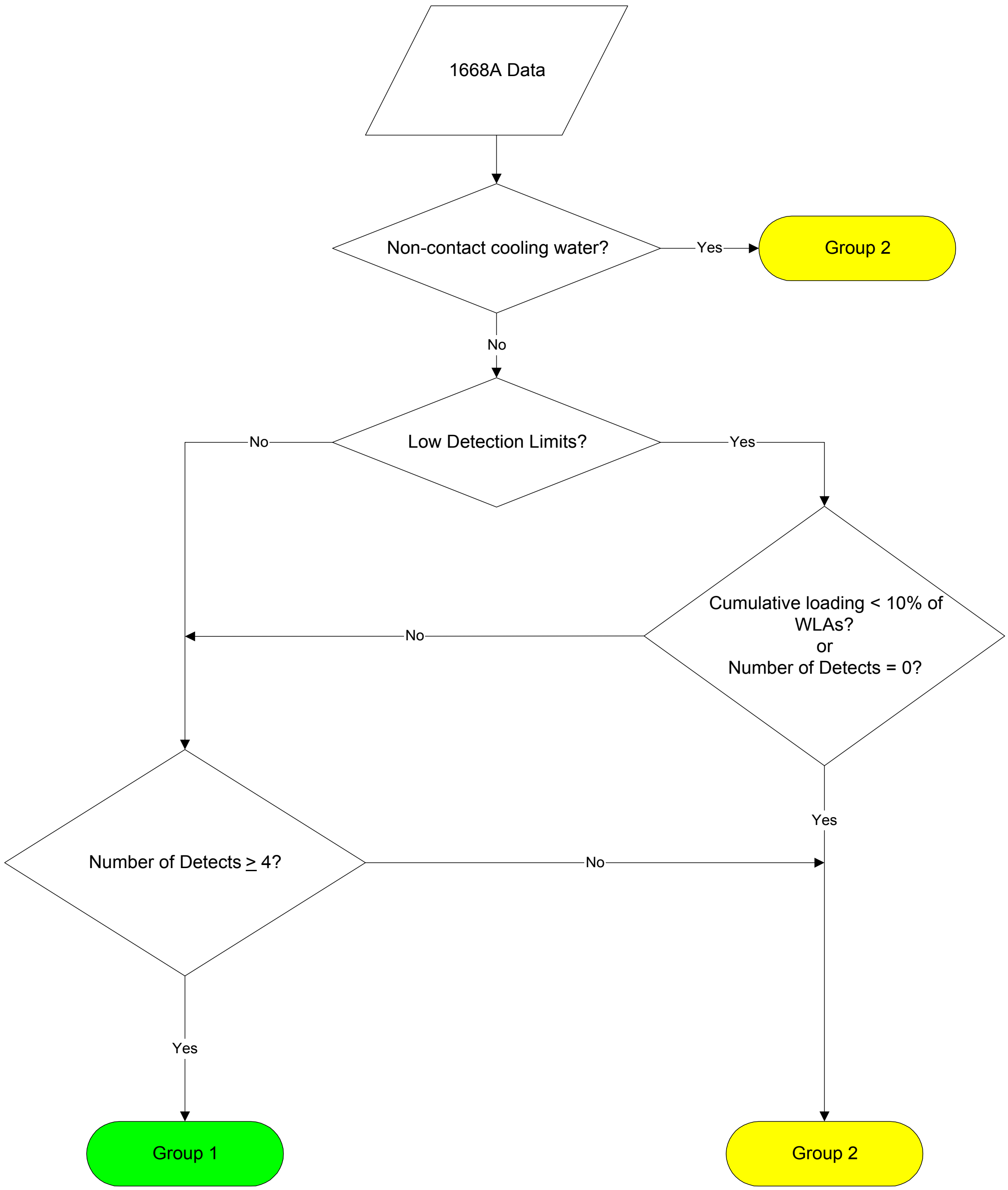
Appendix Tables 3-2 to 3-5 list the discharges assigned to each group as of September 11, 2003. Individual discharges from combined sewer overflows (CSOs) and municipal separate storm sewer systems (MS4s) have not been included in the tables. Table 9 lists the categorical allocation by zone to these two sources. Individual wasteload allocations for the point source dischargers included in the Stage 1 TMDLs are also listed in each table.

Appendix Table 3-1: Distribution of NPDES Discharges to each group in each zone of the Delaware Estuary.

	Number of Discharges				
	Zone 2	Zone 3	Zone 4	Zone 5	Total
Group 1	13	5	25	17	60
Group 2	25	8	25	24	82
Total	38	13	50	41	142



Appendix Figure 3-1: Selection process for permit requirements for NPDES discharges using Method 8082A.



Appendix Figure 3-2: Selection process for permit requirements for NPDES discharges using Method 1668A.

Appendix Table 3-2: Data used to assign the permit requirements for NPDES discharges in Zone 2.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	Trenton	NJ0020923-001	132.2	3	3	Yes	Yes	11.2	No	243.612	*	1
2	PSEG-Burlington	NJ0005002-WTPA	117.4	3	1	Yes	Yes	10.3	No	0.929	*	1
3	U.S. Steel	PA0013463-103	127.0	5	1	Yes	Yes	9.7	No	10.056	*	1
4	U.S. Steel	PA0013463-002	127.4	3	1	Yes	Yes	9.5	No	61.390	*	1
5	U.S. Steel	PA0013463-203	127.0	2	1	Yes	Yes	9.3	No	3.787	*	1
6	Rohm&Haas-Bristol	PA0012769-009	117.1	3	0	Yes	Yes	9.0	No	5.710	*	1
7	Riverside Sewerage Authority	NJ0022519-001	108.8	2	0	No	N/A	7.0	No	124.107	*	1
8	Beverly Sewerage Authority	NJ0027481-001	114.7	1	0	No	N/A	7.0	No	18.890	*	1
9	PSEG-Mercer	NJ0004995-441C	130.4	1	0	Yes	Yes	7.0	No	5.010	*	1
10	AFG Industries	NJ0033022-001A	109.6	1	0	No	N/A	6.0	No	10.258	*	1
11	US Pipe & Foundry	NJ0005266-002A	118.1	0	2	No	N/A	5.0	No	0.807	*	1
12	Cinnaminson Sewerage Authority	NJ0024007-001	108.9	3	3	No	N/A	4.0	No	27.980	*	1
13	Riverton Borough	NJ0021610-001	110.8	1	0	No	N/A	4.0	No	3.853	*	1
1	GEON Company (Burlington) Polyone	NJ0004235-001A	120.3	1	1	No	N/A	3.5	No	15.051	*	2
2	Willingboro Municipal Utilities Authority	NJ0023361-001	110.8	3	0	No	N/A	3.0	No	123.392	*	2
3	Hamilton Township	NJ0026301-001	128.0	3	0	No	N/A	2.7	No	220.791	*	2
4	Bristol Borough	PA0027294-001	118.7	3	3	No	N/A	2.3	No	29.383	*	2
5	City of Burlington	NJ0024660-002	117.6	3	0	No	N/A	2.0	No	46.336	*	2
6	Bristol Township	PA0026450-001	116.8	3	3	No	N/A	1.5	No	34.732	*	2
7	AFG Industries	NJ0033022-002	109.4	0	1	No	N/A	1.0	No	0.092	*	2
8	Mt. Holly Municipal Utilities Authority	NJ0024015-001	110.8	3	0	No	N/A	0.7	No	54.904	*	2
9	Delran Sewerage Authority	NJ0023507-001	110.8	3	0	No	N/A	0.3	No	37.419	*	2
10	Burlington Township	NJ0021709-001	117.0	3	0	No	N/A	0.3	No	34.901	*	2
11	Florence Township	NJ0023701-001	121.4	3	0	No	N/A	0.3	No	15.682	*	2
12	Lower Bucks County Municipal Authority	PA0026468-001	121.9	3	3	No	N/A	0.2	No	129.179	*	2

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
13	Bordentown Sewerage Authority	NJ0024678-001	128.0	3	3	No	N/A	0.2	No	26.292	*	2
14	Mt. Laurel Municipal Utilities Authority	NJ0025178-001A	110.8	3	0	No	N/A	0.0	No	67.433	*	2
15	Morrisville WWTP	PA0026701-001	132.9	3	0	No	N/A	0.0	No	65.566	*	2
16	Waste Management Grows Landfill	PA0043818-001	125.5	1	0	No	N/A	0.0	No	1.182	*	2
17	MSC Pre Finish Metals	PA0045021-001	130.1	1	0	No	N/A	0.0	No	0.646	*	2
18	Hoeganaes Corp.	NJ0004375-001A	109.4	1	1	No	N/A	0.0	No	0.330	*	2
19	Hoeganaes Corp.	NJ0004375-003A	109.4	0	1	No	N/A	0.0	No	0.000	*	2
20	Exelon-Fairless	PA0057088-001	126.6	3	0	Yes	Yes	9.0	Yes	0.000	*	2
21	PSEG-Mercer	NJ0004995-441A	130.4	3	0	Yes	Yes	6.3	Yes	0.000	*	2
22	Colorite Polymers	NJ0004391-003A	117.0	1	0	Yes	Yes	2.0	No	0.740	65.9	2
23	Colorite Polymers	NJ0004391-002A	117.0	1	1	Yes	Yes	4.0	No	0.008	0.7	2
24	Yates Foil	NJ0004332-002A	128.0	0	1	Yes	Yes	2.0	No	0.000	0.0	2
25	Yates Foil	NJ0004332-001B	128.0	1	0	Yes	Yes	0.0	No	0.070	6.3	2

RM: River Mile
DW: Dry Weather
WW: Wet Weather
* Cumulative loading percentages to Zone WLA (minus portions to CSOs and MS4) are shown up to 100 percent.

Appendix Table 3-3: Data used to assign the permit requirements for NPDES discharges in Zone 3.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	PWD-NE	PA0026689-001	104.1	3	3	Yes	Yes	10.5	No	1238.662	*	1
2	CCMUA	NJ0026182-001	98.0	3	3	Yes	Yes	10.0	No	818.459	*	1
3	Exelon-Delaware	PA0011622-002	101.2	3	0	Yes	Yes	9.7	No	0.655	92.5	1
4	PWD-SE	PA0026662-001	96.8	3	3	Yes	Yes	9.7	No	657.721	*	1
5	Rohm&Haas-Philadelphia	PA0012777-003	106.1	1	0	Yes	Yes	7.0	No	2.175	*	1
1	NGC Industries	NJ0004669-001A	104.4	1	1	No	N/A	0.0	No	1.528	*	2
2	Palmyra Borough	NJ0024449-001	107.7	1	0	No	N/A	0.0	No	19.235	*	2
3	Exelon-Delaware	PA0011622-006	101.1	3	0	Yes	Yes	9.3	Yes	0.000	*	2
4	Rohm&Haas-Philadelphia	PA0012777-001	106.1	3	1	Yes	Yes	3.8	No	15.974	*	2
5	Citgo Petroleum	NJ0131342-001A	103.4	1	0	Yes	No	0.0	No	0.012	*	2
6	Rohm&Haas-Philadelphia	PA0012777-007	106.1	1	0	Yes	Yes	6.0	No	0.003	0.4	2
7	Exelon-Delaware	PA0011622-004	101.2	0	1	Yes	Yes	11.0	No	0.011	1.8	2
8	Exelon-Delaware	PA0011622-001	101.2	0	1	Yes	Yes	12.0	No	0.044	7.5	2

RM: River Mile
DW: Dry Weather
WW: Wet Weather
* Cumulative loading percentages to Zone WLA (minus portions to CSOs and MS4) are shown up to 100 percent.

Appendix Table 3-4: Data used to assign the permit requirements for NPDES discharges in Zone 4.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	Dupont-Repauno	NJ0004219-007	86.6	0	1	No	N/A	12.0	No	1.433	*	1
2	Exelon-Eddystone	PA0013716-001	85.2	0	1	Yes	Yes	12.0	No	0.064	14.2	1
3	Dupont-Repauno	NJ0004219-001A	85.6	3	1	Yes	Yes	11.5	No	80.773	*	1
4	Boeing	PA0013323-002	85.4	1	1	Yes	Yes	11.5	No	158.353	*	1
5	Kvaerner	PA0057690-019	92.8	0	1	Yes	Yes	11.0	No	0.100	57.0	1
6	Kvaerner	PA0057690-021	92.8	0	1	Yes	Yes	11.0	No	0.100	73.3	1
7	Boeing	PA0013323-001	85.2	1	0	Yes	Yes	11.0	No	29.068	*	1
8	PWD-SW	PA0026671-001	90.7	3	3	Yes	Yes	10.8	No	1020.466	*	1
9	Valero Refining	NJ0005029-001A	87.7	4	1	Yes	Yes	10.6	No	99.473	*	1
10	Exelon-Eddystone	PA0013716-005	85.2	0	1	Yes	Yes	10.0	No	0.509	*	1
11	Ausimont	NJ0005185-001A	90.7	0	1	Yes	Yes	10.0	No	0.840	*	1
12	Boeing	PA0013323-003	85.2	0	1	Yes	Yes	9.0	No	0.404	*	1
13	Boeing	PA0013323-016	85.4	0	1	Yes	Yes	8.0	No	0.149	97.5	1
14	Boeing	PA0013323-007	85.2	0	1	Yes	Yes	8.0	No	0.235	*	1
15	Tinicum Township	PA0028380-001	85.4	3	3	Yes	Yes	8.0	No	15.450	*	1
16	Safety Kleen	NJ0005240-002A	79.8	0	1	No	N/A	7.0	No	3.512	*	1
17	Kvaerner	PA0057690-012	92.7	3	0	Yes	Yes	7.0	No	22.608	*	1
18	DELCORA	PA0027103-001	80.6	3	3	Yes	Yes	6.7	No	309.423	*	1
19	GCUA	NJ0024686-001	88.4	5	0	Yes	Yes	6.4	No	113.497	*	1
20	ConocoPhillips	PA0012637-008	80.2	0	1	No	N/A	6.0	No	0.111	*	1
21	Metro Machine	PA0057479-DD2	93.2	4	0	No	N/A	6.0	No	49.040	*	1
22	Hercules	NJ0005134-001A	87.5	1	1	Yes	Yes	6.0	No	4.120	*	1
23	Kimberly Clark	PA0013081-029	83.2	0	2	Yes	Yes	5.5	No	0.086	40.6	1
24	ConocoPhillips	PA0012637-007	80.2	0	1	No	N/A	5.0	No	0.511	*	1
25	Ausimont	NJ0005185-002A	90.7	1	0	Yes	Yes	5.0	No	0.077	26.7	1

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	ConocoPhillips	PA0012637-006	80.2	0	1	No	N/A	3.0	No	0.029	*	2
2	Coastal Mart / Coastal Eagle Point Oil	NJ0005401-003A	94.7	0	1	No	N/A	2.0	No	0.006	*	2
3	ConocoPhillips	PA0012637-002	80.2	3	1	No	N/A	1.5	Yes	0.000	*	2
4	ConocoPhillips	PA0012637-101	79.6	3	1	No	N/A	1.0	Yes	0.000	*	2
5	Swedesboro	NJ0022021-001	79.8	1	0	No	N/A	1.0	No	3.296	*	2
6	Logan Township	NJ0027545-001	79.5	1	1	No	N/A	1.0	No	12.114	*	2
7	Safety Kleen	NJ0005240-001A	79.8	3	0	No	N/A	0.7	No	7.440	*	2
8	Metro Machine	PA0057479-DD3	93.1	3	0	No	N/A	0.7	No	17.845	*	2
9	Chevron	NJ0064696-001A	90.5	1	0	No	N/A	0.0	No	0.157	*	2
10	Harrison Township-Mullica Hill	NJ0020532-001	79.8	1	0	No	N/A	0.0	No	6.093	*	2
11	DeGuessa-Huls Corp.	PA0051713-001	82.2	1	0	No	N/A	0.0	No	9.063	*	2
12	Air Products	NJ0004278-001A	88.2	1	0	No	N/A	0.0	No	10.041	*	2
13	Greenwich Township	NJ0030333-001	87.0	1	0	No	N/A	0.0	No	12.110	*	2
14	ConocoPhillips	PA0012637-201	79.6	3	0	No	N/A	0.0	No	48.580	*	2
15	Coastal Mart / Coastal Eagle Point Oil	NJ0005401-001A	94.3	3	0	No	N/A	0.0	No	55.368	*	2
16	Exelon-Eddystone	PA0013716-008	85.2	4	0	Yes	Yes	11.8	Yes	0.000	*	2
17	Exelon-Eddystone	PA0013716-007	85.2	3	0	Yes	Yes	11.7	Yes	0.000	*	2
18	Solutia	NJ0005045-001	79.2	3	0	Yes	No	1.3	No	12.228	*	2
19	Colonial Pipeline	NJ0033952-001A	90.5	0	1	Yes	No	0.0	No	0.087	*	2
20	BP Paulsboro	NJ0005584-002A	89.6	0	1	Yes	No	0.0	No	0.352	*	2
21	BP Paulsboro	NJ0005584-003A	89.4	1	0	Yes	No	0.0	No	7.006	*	2
22	Sunoco-PointBreeze	PA0012629-002	92.5	3	3	Yes	No	0.0	No	75.899	*	2
23	Sunoco-GirardPoint	PA0011533-015	92.5	3	3	Yes	No	0.0	No	99.167	*	2
24	Kvaerner	PA0057690-047	92.5	0	1	Yes	Yes	10.0	No	0.005	0.8	2
25	Boeing	PA0013323-008	85.2	0	1	Yes	Yes	13.0	No	0.018	3.7	2

Appendix Table 3-5: Data used to assign the permit requirements for NPDES discharges in Zone 5.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	AMTRAK	DE0050962-003	70.7	0	3	Yes	Yes	12.3	No	2.002	*	1
2	AMTRAK	DE0050962-004	70.7	0	3	Yes	Yes	12.0	No	35.822	*	1
3	OxyChem	DE0050911-002	62.2	0	3	Yes	Yes	11.0	No	0.168	16.8	1
4	Conectiv-Deepwater	NJ0005363-017	69.1	0	1	Yes	Yes	11.0	No	0.284	25.9	1
5	PSEG-Salem	NJ0005622-489	51.0	1	0	Yes	Yes	11.0	No	0.984	86.5	1
6	Metachem	DE0020001-003	61.9	0	4	No	N/A	9.5	No	2.176	*	1
7	Metachem	DE0020001-002	61.9	0	3	No	N/A	9.3	No	1.713	*	1
8	Dupont-Edgemoor	DE0000051-004	72.2	0	3	Yes	Yes	9.0	No	0.153	11.5	1
9	Dupont-Edgemoor	DE0000051-001	73.2	3	0	Yes	Yes	8.7	No	32.214	*	1
10	Dupont-ChamberWorks	NJ0005100-662	69.8	3	0	Yes	Yes	8.7	No	102.854	*	1
11	Dupont-ChamberWorks	NJ0005100-001	69.8	3	0	Yes	Yes	8.0	No	138.476	*	1
12	Motiva	DE0000256-101	61.0	3	3	Yes	Yes	7.5	No	2843.225	*	1
13	OxyChem	DE0050911-001	62.2	3	0	Yes	Yes	7.0	No	1.798	*	1
14	Penns Grove Sewer Authority	NJ0024023-001	70.7	1	0	No	N/A	7.0	No	23.206	*	1
15	PSEG-HopeCreek	NJ0025411-461C	52.0	1	0	Yes	Yes	5.0	No	0.915	55.1	1
16	Motiva	DE0000256-601	61.5	3	0	Yes	Yes	5.0	No	0.000 **	*	1
17	Pennsville Sewerage Authority	NJ0021598-001	65.1	3	0	No	N/A	4.7	No	63.353	*	1
1	Carney's Point	NJ0021601-001	71.3	3	0	No	N/A	2.7	No	10.265	*	2
2	General Chemical	DE0000655-001	77.9	3	3	No	N/A	2.2	Yes	0.000	*	2
3	Port Penn STP (New Castle Co.)	DE0021539-001	54.8	1	0	No	N/A	1.0	No	0.487	*	2
4	Metachem	DE0020001-001	61.5	3	3	No	N/A	1.0	No	81.182	*	2
5	City of Wilmington	DE0020320-001	71.6	3	3	No	N/A	0.8	No	1297.745	*	2
6	Geon Company (Pedricktown) Polyone	NJ0004286-003	75.9	0	1	No	N/A	0.0	No	0.011	*	2
7	Geon Company (Pedricktown) Polyone	NJ0004286-001A	74.9	1	0	No	N/A	0.0	No	1.690	*	2
8	Kaneka Delaware Corp.	DE0000647-001	61.4	1	1	No	N/A	0.0	No	2.266	*	2
9	Delaware City STP (New Castle Co.)	DE0021555-001	60.1	1	0	No	N/A	0.0	No	4.085	*	2

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
10	Formosa Plastics	DE0000612-001	61.3	1	0	No	N/A	0.0	No	4.885	*	2
11	City of Salem	NJ0024856-001	58.8	3	0	No	N/A	0.0	No	10.062	*	2
12	PSEG-HopeCreek	NJ0025411-461A	52.0	3	0	Yes	Yes	9.7	Yes	0.000	*	2
13	Dupont-ChamberWorks	NJ0005100-013	68.9	3	0	Yes	Yes	9.3	Yes	0.000	*	2
14	PSEG-Salem	NJ0005622-485	51.0	3	0	Yes	Yes	9.0	Yes	0.000	*	2
15	Motiva	DE0000256-001	61.5	3	0	Yes	Yes	8.7	Yes	0.000	*	2
16	Conectiv-Deepwater	NJ0005363-003A	69.1	1	0	Yes	Yes	8.0	Yes	0.000	*	2
17	Dupont-ChamberWorks	NJ0005100-011	68.9	1	1	Yes	Yes	11.0	No	0.004	0.1	2
18	Conectiv-DelawareCity	DE0050601-033	61.9	0	3	Yes	Yes	11.7	No	0.005	0.3	2
19	Conectiv-Deepwater	NJ0005363-006	69.1	0	1	Yes	Yes	12.0	No	0.006	0.5	2
20	Conectiv-Edgemoor	DE0000558-041	71.8	0	3	Yes	Yes	10.7	No	0.008	0.7	2
21	PSEG-HopeCreek	NJ0025411-462A	52.0	0	1	Yes	Yes	0.0	No	0.011	1.0	2
22	Conectiv-DelawareCity	DE0050601-034	61.9	0	4	Yes	Yes	11.5	No	0.015	1.5	2
23	Conectiv-Deepwater	NJ0005363-005	69.1	0	1	Yes	Yes	10.0	No	0.035	2.6	2
24	Conectiv-DelawareCity	DE0050601-016	61.9	0	3	Yes	Yes	11.7	No	0.123	6.6	2

RM: River Mile
DW: Dry Weather
WW: Wet Weather

* Cumulative loading percentages to Zone WLA (minus portions to CSOs and MS4) are shown up to 100 percent.

** Flow is set to zero in the loading calculation because DSN 601 is an upstream monitoring point of DSN 101.

Appendix 4

Contaminated Sites and Municipalities with Combined Sewer Overflows (CSOs) that were evaluated as part of the Stage 1 TMDLs

Appendix Table 4-1: Contaminated Sites evaluated as part of the Stage 1 TMDLs and their estimated Penta-PCB Load.

Facility	Daily penta-PCB Load (kg/day)	Estimate Prepared by
Castle Ford - DE-192	1.4374E-06	EPA
Forbes Steel & Wire Corp. - DE-165	5.1989E-06	EPA
Rogers Corner Dump - DE-246	1.0465E-04	EPA
Industrial Products - DE-030	5.1129E-05	EPA
Chicago Bridge and Iron - DE-038	3.2768E-03	EPA
ABM-Wade, 58th Street Dump - PA-0179	1.9739E-06	EPA
O'Donnell Steel Drum - PA-0305	3.4939E-07	EPA
Conrail-Wayne Junction - PA-215	2.3043E-03	EPA
CONRAIL, Morrisville Lagoons - PA-441*	5.4056E-06	EPA
Pennwalt Corp. - Cornwells Heights - PA-0031*	3.1227E-07	EPA
Front Street Tanker - PA-2298	1.9914E-06	EPA
8th Street Drum - PA-3272	8.9655E-07	EPA
East 10th Street Site - PA-2869	1.0076E-02	EPA
Metal Bank - PA-2119	9.9092E-05	EPA
Lower Darby Creek Area Site - PA-3424	1.8481E-04	EPA
Roebling Steel Co.	4.9609E-05	EPA
Bridgeport Rental & Oil Services (BROS)	5.8140E-04	EPA
Dana Transport Inc.	3.8523E-08	EPA
Harrison Avenue Landfill	6.2542E-03	EPA
Metal Bank groundwater pathway	9.8312E-07	DRBC
AMTRAK Former Refueling Facility	1.3182E-03	DNREC
Gates Engineering	6.8226E-10	DNREC
AMTRAK Wilmington Railyard	1.6238E-03	DNREC
Diamond State Salvage	0.0000E+00	DNREC
NeCastro Auto Salvage	1.2867E-05	DNREC
Hercules Research Center	4.6121E-06	DNREC
Dravo Ship Yard	5.3216E-05	DNREC
DP&L/Congo Marsh	2.7290E-07	DNREC
American Scrap & Waste	7.4230E-04	DNREC
Pusey & Jones Shipyard	1.6033E-06	DNREC
Delaware Car Company	0.0000E+00	DNREC
Bafundo Roofing	1.5692E-04	DNREC
Kreiger Finger Property	1.5828E-04	DNREC
Clayville Dump	0.0000E+00	DNREC
Electric Hose & Rubber	8.8694E-05	DNREC
Penn Del Metal Recycling	1.1407E-04	DNREC
E. 7th Street North & South	5.7992E-05	DNREC
Delaware Compressed Steel	6.2877E-06	DNREC
Newport City Landfill	0.0000E+00	DNREC
DuPont Louviers – MBNA	9.5516E-08	DNREC
North American Smelting Co.	1.2821E-05	DNREC
RSC Realty	3.4113E-05	DNREC
AMTRAK CNOC	0.0000E+00	DNREC
Wilmington Coal Gas – N	2.2378E-06	DNREC

Facility	Daily penta-PCB Load (kg/day)	Estimate Prepared by
Del Chapel Place	2.2515E-06	DNREC
Kruse Playground	1.0643E-06	DNREC
Budd Metal	6.3450E-06	DNREC
Fox Point Park Phase II	1.1708E-04	DNREC
Bensalem Redev LP (Elf Atochem)	1.7561E-05	PADEP

Appendix Table 4-2: Municipalities or Regional Authorities with Combined Sewer Overflows (CSOs) that were evaluated as part of the Stage 1 TMDLs

Municipality/Regional Authority	NPDES Nos.	Zone
City of Philadelphia Water Department	PA0026662 PA0026671 PA0026689	2, 3 and 4
Camden County Municipal Utilities Authority	NJ0108812 NJ0026182	3 and 4
Delaware County Regional Authority (DELCORA)	PA0027103	4
City of Wilmington	DE0020320	5

Appendix 5

Municipalities in Delaware, New Jersey, and Pennsylvania,
designated as Phase II Separate Stormwater Sewer Systems (MS4s)
within urbanized areas in the Delaware River Watershed

Appendix Table 5-1: Municipalities with Separate Stormwater Sewer Systems that have the potential to be included in the waste load allocation (LA) for PCBs for Zones 2 to 5 of the Delaware Estuary.

STATE	COUNTY NAME	MUNICIPALITY NAME
DE	KENT	CAMDEN TOWN
DE	KENT	DOVER CITY
DE	KENT	KENT COUNTY
DE	NEW CASTLE	NEWARK CITY
DE	NEW CASTLE/DE DOT	ARDEN
DE	NEW CASTLE/DE DOT	ARDENTOWN
DE	NEW CASTLE/DE DOT	ARDENCROFT
DE	NEW CASTLE/DE DOT	BELLEFONTE
DE	NEW CASTLE/DE DOT	DELAWARE CITY
DE	NEW CASTLE/DE DOT	ELSMERE
DE	NEW CASTLE/DE DOT	MIDDLETOWN
DE	NEW CASTLE/DE DOT	NEWPORT
DE	NEW CASTLE/DE DOT	NEW CASTLE
DE	NEW CASTLE/DE DOT	ODDESSA
DE	NEW CASTLE/DE DOT	TOWNSEND
DE	NEW CASTLE/DE DOT	CITY OF WILMINGTON
DE	KENT	WYOMING TOWN

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	ATLANTIC	BUENA BORO
NJ	ATLANTIC	BUENA VISTA TWP
NJ	BURLINGTON	BEVERLY CITY
NJ	BURLINGTON	BORDENTOWN CITY
NJ	BURLINGTON	BORDENTOWN TWP
NJ	BURLINGTON	BURLINGTON CITY
NJ	BURLINGTON	BURLINGTON TWP
NJ	BURLINGTON	CHESTERFIELD TWP
NJ	BURLINGTON	CINNAMINSON TWP
NJ	BURLINGTON	CINNAMINSON TWP
NJ	BURLINGTON	DELANCO TWP
NJ	BURLINGTON	DELRAN TWP
NJ	BURLINGTON	EASTAMPTON TWP
NJ	BURLINGTON	EDGEWATER PARK TWP
NJ	BURLINGTON	EVESHAM TWP
NJ	BURLINGTON	EVESHAM TWP
NJ	BURLINGTON	FIELDSBORO BORO
NJ	BURLINGTON	FLORENCE TWP
NJ	BURLINGTON	HAINESPORT TWP
NJ	BURLINGTON	LUMBERTON TWP
NJ	BURLINGTON	MANSFIELD TWP
NJ	BURLINGTON	MAPLE SHADE TWP
NJ	BURLINGTON	MEDFORD LAKES BORO
NJ	BURLINGTON	MEDFORD TWP
NJ	BURLINGTON	MOORESTOWN TWP
NJ	BURLINGTON	MOORESTOWN TWP
NJ	BURLINGTON	MOUNT HOLLY TWP

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	BURLINGTON	MOUNT LAUREL TWP
NJ	BURLINGTON	MOUNT LAUREL TWP
NJ	BURLINGTON	NEW HANOVER TWP
NJ	BURLINGTON	NORTH HANOVER TWP
NJ	BURLINGTON	PALMYRA BORO
NJ	BURLINGTON	PALMYRA BORO
NJ	BURLINGTON	PEMBERTON BORO
NJ	BURLINGTON	PEMBERTON TWP
NJ	BURLINGTON	RIVERSIDE TWP
NJ	BURLINGTON	RIVERTON BORO
NJ	BURLINGTON	SHAMONG TWP
NJ	BURLINGTON	SOUTHAMPTON TWP
NJ	BURLINGTON	SPRINGFIELD TWP
NJ	BURLINGTON	TABERNACLE TWP
NJ	BURLINGTON	TABERNACLE TWP
NJ	BURLINGTON	WESTAMPTON TWP
NJ	BURLINGTON	WILLINGBORO TWP
NJ	BURLINGTON	WOODLAND TWP
NJ	BURLINGTON	WRIGHTSTOWN BORO
NJ	CAMDEN	AUDUBON BORO
NJ	CAMDEN	AUDUBON PARK BORO
NJ	CAMDEN	BARRINGTON BORO
NJ	CAMDEN	BELLMAWR BORO
NJ	CAMDEN	BERLIN BORO
NJ	CAMDEN	BERLIN TWP
NJ	CAMDEN	BERLIN TWP
NJ	CAMDEN	BROOKLAWN BORO
NJ	CAMDEN	CAMDEN CITY
NJ	CAMDEN	CHERRY HILL TWP
NJ	CAMDEN	CLEMENTON BORO
NJ	CAMDEN	COLLINGSWOOD BORO

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	CAMDEN	GIBBSBORO BORO
NJ	CAMDEN	GIBBSBORO BORO
NJ	CAMDEN	GIBBSBORO BORO
NJ	CAMDEN	GLOUCESTER CITY
NJ	CAMDEN	GLOUCESTER CITY
NJ	CAMDEN	GLOUCESTER TWP
NJ	CAMDEN	GLOUCESTER TWP
NJ	CAMDEN	HADDON HEIGHTS BORO
NJ	CAMDEN	HADDON TWP (EAST)
NJ	CAMDEN	HADDON TWP (NORTH)
NJ	CAMDEN	HADDON TWP (SOUTH)
NJ	CAMDEN	HADDONFIELD BORO
NJ	CAMDEN	HI-NELLA BORO
NJ	CAMDEN	LAUREL SPRINGS BORO
NJ	CAMDEN	LAWNSIDE BORO
NJ	CAMDEN	LINDENWOLD BORO
NJ	CAMDEN	MAGNOLIA BORO
NJ	CAMDEN	MERCHANTVILLE BORO
NJ	CAMDEN	MOUNT EPHRAIM BORO
NJ	CAMDEN	OAKLYN BORO
NJ	CAMDEN	PENNSAUKEN TWP
NJ	CAMDEN	PINE HILL BORO
NJ	CAMDEN	PINE HILL BORO
NJ	CAMDEN	PINE VALLEY BORO
NJ	CAMDEN	RUNNEMEDE BORO
NJ	CAMDEN	SOMERDALE BORO
NJ	CAMDEN	STRATFORD BORO
NJ	CAMDEN	TAVISTOCK BORO
NJ	CAMDEN	VOORHEES TWP
NJ	CAMDEN	VOORHEES TWP

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	CAMDEN	VOORHEES TWP
NJ	CAMDEN	VOORHEES TWP
NJ	CAMDEN	WINSLOW TWP
NJ	CAMDEN	WINSLOW TWP
NJ	CAMDEN	WINSLOW TWP
NJ	CAMDEN	WOODLYNNE BORO
NJ	CAPE_MAY	CAPE MAY POINT BORO
NJ	CAPE_MAY	DENNIS TWP
NJ	CAPE_MAY	LOWER TWP
NJ	CAPE_MAY	LOWER TWP
NJ	CAPE_MAY	MIDDLE TWP
NJ	CAPE_MAY	WEST CAPE MAY BORO
NJ	CAPE_MAY	WOODBINE BORO
NJ	CUMBERLAND	BRIDGETON CITY
NJ	CUMBERLAND	COMMERCIAL TWP
NJ	CUMBERLAND	DEERFIELD TWP
NJ	CUMBERLAND	DOWNE TWP
NJ	CUMBERLAND	FAIRFIELD TWP
NJ	CUMBERLAND	GREENWICH TWP
NJ	CUMBERLAND	HOPEWELL TWP
NJ	CUMBERLAND	LAWRENCE TWP
NJ	CUMBERLAND	MAURICE RIVER TWP
NJ	CUMBERLAND	MILLVILLE CITY
NJ	CUMBERLAND	SHILOH BORO
NJ	CUMBERLAND	STOW CREEK TWP
NJ	CUMBERLAND	UPPER DEERFIELD TWP
NJ	CUMBERLAND	VINELAND CITY
NJ	GLOUCESTER	CLAYTON BORO
NJ	GLOUCESTER	DEPTFORD TWP
NJ	GLOUCESTER	DEPTFORD TWP

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	GLOUCESTER	DEPTFORD TWP
NJ	GLOUCESTER	EAST GREENWICH TWP
NJ	GLOUCESTER	ELK TWP
NJ	GLOUCESTER	ELK TWP
NJ	GLOUCESTER	ELK TWP
NJ	GLOUCESTER	FRANKLIN TWP
NJ	GLOUCESTER	GLASSBORO BORO
NJ	GLOUCESTER	GLASSBORO BORO
NJ	GLOUCESTER	GREENWICH TWP
NJ	GLOUCESTER	HARRISON TWP
NJ	GLOUCESTER	LOGAN TWP
NJ	GLOUCESTER	LOGAN TWP
NJ	GLOUCESTER	MANTUA TWP
NJ	GLOUCESTER	MONROE TWP
NJ	GLOUCESTER	MONROE TWP
NJ	GLOUCESTER	MONROE TWP
NJ	GLOUCESTER	NATIONAL PARK BORO
NJ	GLOUCESTER	NEWFIELD BORO
NJ	GLOUCESTER	PAULSBORO BORO
NJ	GLOUCESTER	PITMAN BORO
NJ	GLOUCESTER	SOUTH HARRISON TWP
NJ	GLOUCESTER	SOUTH HARRISON TWP
NJ	GLOUCESTER	SWEDESBORO BORO
NJ	GLOUCESTER	WASHINGTON TWP
NJ	GLOUCESTER	WASHINGTON TWP
NJ	GLOUCESTER	WASHINGTON TWP
NJ	GLOUCESTER	WENONAH BORO
NJ	GLOUCESTER	WEST DEPTFORD TWP
NJ	GLOUCESTER	WEST DEPTFORD TWP
NJ	GLOUCESTER	WESTVILLE BORO

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	GLOUCESTER	WOODBURY CITY
NJ	GLOUCESTER	WOODBURY CITY
NJ	GLOUCESTER	WOODBURY HEIGHTS BORO
NJ	GLOUCESTER	WOOLWICH TWP
NJ	GLOUCESTER	WOOLWICH TWP
NJ	MERCER	HAMILTON TWP
NJ	MERCER	TRENTON CITY
NJ	MERCER	TRENTON CITY
NJ	MERCER	WASHINGTON TWP
NJ	MONMOUTH	ALLENTOWN BORO
NJ	MONMOUTH	MILLSTONE TWP
NJ	MONMOUTH	UPPER FREEHOLD TWP
NJ	OCEAN	JACKSON TWP
NJ	OCEAN	JACKSON TWP
NJ	OCEAN	JACKSON TWP
NJ	OCEAN	LACEY TWP
NJ	OCEAN	MANCHESTER TWP
NJ	OCEAN	PLUMSTED TWP
NJ	SALEM	ALLOWAY TWP
NJ	SALEM	ALLOWAY TWP
NJ	SALEM	CARNEYS POINT TWP
NJ	SALEM	ELMER BORO
NJ	SALEM	ELSINBORO TWP
NJ	SALEM	LOWER ALLOWAYS CREEK TWP
NJ	SALEM	LOWER ALLOWAYS CREEK TWP
NJ	SALEM	LOWER ALLOWAYS CREEK TWP
NJ	SALEM	MANNINGTON TWP

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	SALEM	OLDMANS TWP
NJ	SALEM	PENNS GROVE BORO
NJ	SALEM	PENNSVILLE TWP
NJ	SALEM	PILESGROVE TWP
NJ	SALEM	PITTSGROVE TWP
NJ	SALEM	QUINTON TWP
NJ	SALEM	QUINTON TWP
NJ	SALEM	SALEM CITY
NJ	SALEM	UPPER PITTSGROVE TWP
NJ	SALEM	UPPER PITTSGROVE TWP
NJ	SALEM	WOODSTOWN BORO

State	County Name	Municipality Name	State	County Name	Municipality Name
PA	Bucks	Bensalem Twp.	PA	Bucks	Upper Makefield Twp.
PA	Bucks	Bristol Boro	PA	Bucks	Upper Southampton Twp.
PA	Bucks	Bristol Twp.	PA	Bucks	Warminster Twp.
PA	Bucks	Buckingham Twp.	PA	Bucks	Warrington Twp.
PA	Bucks	Bucks County	PA	Bucks	Warwick Twp.
PA	Bucks	Chalfont Boro	PA	Bucks	West Rockhill Twp.
PA	Bucks	Doylestown Boro	PA	Bucks	Wrightstown Twp.
PA	Bucks	Doylestown Twp.	PA	Bucks	Yardley Boro
PA	Bucks	East Rockhill Twp.	PA	Chester	Avondale Boro
PA	Bucks	Falls Twp.	PA	Chester	Birmingham Twp.
PA	Bucks	Hilltown Twp.	PA	Chester	Caln Twp.
PA	Bucks	Hulmeville Boro	PA	Chester	Charlestown Twp.
PA	Bucks	Ivyland Boro	PA	Chester	Chester County
PA	Bucks	Langhorne Boro	PA	Chester	Coatesville City
PA	Bucks	Langhorne Manor Boro	PA	Chester	Downingtown Boro
PA	Bucks	Lower Makefield Twp.	PA	Chester	East Bradford Twp.
PA	Bucks	Lower Southampton Twp.	PA	Chester	East Brandywine Twp.
PA	Bucks	Middletown Twp.	PA	Chester	East Caln Twp.
PA	Bucks	Morrisville Boro	PA	Chester	East Fallowfield Twp.
PA	Bucks	New Britain Boro	PA	Chester	East Goshen Twp.
PA	Bucks	New Britain Twp.	PA	Chester	East Marlborough Twp.
PA	Bucks	Newtown Boro	PA	Chester	East Pikeland Twp.
PA	Bucks	Newtown Twp.	PA	Chester	East Vincent Twp.
PA	Bucks	Northampton Twp.	PA	Chester	East Whiteland Twp.
PA	Bucks	Penndel Boro	PA	Chester	Easttown Twp.
PA	Bucks	Perkasie Boro	PA	Chester	Franklin Twp.
PA	Bucks	Plumstead Twp.	PA	Chester	Honeybrook Twp.
PA	Bucks	Sellersville Boro	PA	Chester	Kennett Square Boro
PA	Bucks	Silverdale Boro	PA	Chester	Kennett Twp.
PA	Bucks	Solebury Twp.	PA	Chester	London Britain Twp.
PA	Bucks	Tullytown Boro	PA	Chester	London Grove Twp.

State	County Name	Municipality Name
PA	Chester	Malvern Boro
PA	Chester	Modena Boro
PA	Chester	New Garden Twp.
PA	Chester	New London Twp.
PA	Chester	Newlin Twp.
PA	Chester	Parkesburg Boro
PA	Chester	Penn Twp.
PA	Chester	Pennsbury Twp.
PA	Chester	Phoenixville Boro
PA	Chester	Pocopson Twp.
PA	Chester	Sadsbury Twp.
PA	Chester	Schuylkill Twp.
PA	Chester	South Coatesville Boro
PA	Chester	Spring City Boro
PA	Chester	Thornbury Twp.
PA	Chester	Tredyffrin Twp.
PA	Chester	Upper Oxford Twp.
PA	Chester	Upper Uwchlan Twp.
PA	Chester	Uwchlan Twp.
PA	Chester	Valley Twp.
PA	Chester	Wallace Twp.
PA	Chester	West Bradford Twp.
PA	Chester	West Brandywine Twp.
PA	Chester	West Caln Twp.
PA	Chester	West Chester Boro
PA	Chester	West Goshen Twp.
PA	Chester	West Grove Boro
PA	Chester	West Pikeland Twp.
PA	Chester	West Sadsbury Twp.
PA	Chester	West Vincent Twp.
PA	Chester	West Whiteland Twp.

State	County Name	Municipality Name
PA	Chester	Westtown Twp.
PA	Chester	Willistown Twp.
PA	Delaware	Aldan Boro
PA	Delaware	Aston Twp.
PA	Delaware	Bethel Twp.
PA	Delaware	Brookhaven Boro
PA	Delaware	Chadds Ford Twp.
PA	Delaware	Chester City
PA	Delaware	Chester Heights Boro
PA	Delaware	Chester Twp.
PA	Delaware	Clifton Heights Boro
PA	Delaware	Collingdale Boro
PA	Delaware	Colwyn Boro
PA	Delaware	Concord Twp.
PA	Delaware	Darby Boro
PA	Delaware	Darby Twp.
PA	Delaware	Delaware County
PA	Delaware	East Lansdowne Boro
PA	Delaware	Eddystone Boro
PA	Delaware	Edgemont Twp.
PA	Delaware	Folcroft Boro
PA	Delaware	Glenolden Boro
PA	Delaware	Haverford Twp.
PA	Delaware	Lansdowne Boro
PA	Delaware	Lower Chichester Twp.
PA	Delaware	Marcus Hook Boro
PA	Delaware	Marple Twp.
PA	Delaware	Media Boro
PA	Delaware	Middletown Twp.
PA	Delaware	Millbourne Boro
PA	Delaware	Morton Boro

State	County Name	Municipality Name
PA	Delaware	Nether Providence Twp.
PA	Delaware	Newtown Twp.
PA	Delaware	Norwood Boro
PA	Delaware	Parkside Boro
PA	Delaware	Prospect Park Boro
PA	Delaware	Radnor Twp.
PA	Delaware	Ridley Park Boro
PA	Delaware	Ridley Twp.
PA	Delaware	Rose Valley Boro
PA	Delaware	Rutledge Boro
PA	Delaware	Sharon Hill Boro
PA	Delaware	Springfield Twp.
PA	Delaware	Swarthmore Boro
PA	Delaware	Thornbury Twp.
PA	Delaware	Tinicum Twp.
PA	Delaware	Trainer Boro
PA	Delaware	Upland Boro
PA	Delaware	Upper Chichester Twp.
PA	Delaware	Upper Darby Twp.
PA	Delaware	Upper Providence Twp.
PA	Delaware	Yeadon Boro
PA	Montgomery	Abington Twp.
PA	Montgomery	Ambler Boro
PA	Montgomery	Bridgeport Boro
PA	Montgomery	Bryn Athyn Boro
PA	Montgomery	Cheltenham Twp.
PA	Montgomery	Collegeville Boro
PA	Montgomery	Conshohocken Boro
PA	Montgomery	East Greenville Boro
PA	Montgomery	East Norriton Twp.
PA	Montgomery	Franconia Twp.
PA	Montgomery	Green Lane Boro
PA	Montgomery	Hatboro Boro
PA	Montgomery	Hatfield Boro
PA	Montgomery	Hatfield Twp.
PA	Montgomery	Horsham Twp.
PA	Montgomery	Jenkintown Boro
PA	Montgomery	Lansdale Boro
PA	Montgomery	Limerick Twp.
PA	Montgomery	Lower Frederick Twp.
PA	Montgomery	Lower Gwynedd Twp.
PA	Montgomery	Lower Merion Twp.
PA	Montgomery	Lower Moreland Twp.
PA	Montgomery	Lower Pottsgrove Twp.
PA	Montgomery	Lower Providence Twp.
PA	Montgomery	Lower Salford Twp.
PA	Montgomery	Marlborough Twp.
PA	Montgomery	Montgomery Twp.
PA	Montgomery	Narberth Boro
PA	Montgomery	Norristown Boro
PA	Montgomery	North Wales Boro
PA	Montgomery	Pennsburg Boro
PA	Montgomery	Perkiomen Twp.
PA	Montgomery	Plymouth Twp.
PA	Montgomery	Red Hill Boro
PA	Montgomery	Rockledge Boro
PA	Montgomery	Royersford Boro
PA	Montgomery	Salford Twp.
PA	Montgomery	Schwenksville Boro
PA	Montgomery	Skippack Twp.
PA	Montgomery	Souderton Boro
PA	Montgomery	Springfield Twp.

STATE	COUNTY NAME	MUNICIPALITY NAME
PA	MONTGOMERY	TELFORD BORO
PA	MONTGOMERY	TOWAMENCIN TWP.
PA	MONTGOMERY	TRAPPE BORO
PA	MONTGOMERY	UPPER DUBLIN TWP.
PA	MONTGOMERY	UPPER FREDERICK TWP.
PA	MONTGOMERY	UPPER GWYNEDD TWP.
PA	MONTGOMERY	UPPER HANOVER TWP.
PA	MONTGOMERY	UPPER MERION TWP.
PA	MONTGOMERY	UPPER MORELAND TWP.
PA	MONTGOMERY	UPPER PROVIDENCE TWP.
PA	MONTGOMERY	UPPER SALFORD TWP.
PA	MONTGOMERY	WEST CONSHOHOCKEN BORO.
PA	MONTGOMERY	WEST NORRITON TWP.
PA	MONTGOMERY	WHITEMARSH TWP.
PA	MONTGOMERY	WHITPAIN TWP.
PA	MONTGOMERY	WORCESTER TWP.
PA	PHILADELPHIA	PHILADELPHIA CITY
PA	PHILADELPHIA	PHILADELPHIA COUNTY

Appendix 6

Wasteload Allocation Estimates for Municipal Separate Storm Sewer Systems (MS4s)

A November 22, 2002 EPA Memorandum entitled, "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm water Source and NPDES Permit Requirements Based on Those WLAs" clarified existing regulatory requirements for municipal separate storm sewer systems (MS4s) connected with TMDLs, i.e. that where a TMDL has been developed, the MS4 community must receive a WLA rather than a LA. In the draft TMDL document, EPA identified two options for assigning MS4 WLAs. This Appendix outlines the method used to assign each zone with a single categorical WLA for multiple point sources of storm water discharges.

EPA's regulations require NPDES-regulated storm water discharges to be addressed by the WLA component of a TMDL. In order to estimate the portion of the Load Allocation (LA) that corresponds to separate storm sewer systems (MS4) so that these MS4 allocations could be converted to Wasteload Allocations (WLAs) we considered the land uses within each zone, downstream of the tributary monitoring locations. In order to be consistent with the WLAs, we only considered MS4's likely to discharge to the mainstem Delaware or tidal portions of tributaries. Since delineated MS4 service areas have not been identified for many communities, we assumed that approximately 90% of areas categorized as *High Intensity Residential* area, and 70% of areas categorized as either *Low Intensity Residential* or *Commercial / Industrial / Transportation* are served by MS4 systems. We assumed that the entire PCB load associated with MS4s would correspond to the Non-Point Source Runoff category previously defined. Appendix Figure 6-1 below shows the Non-Point Source area contributing to each Zone. Zone 6 is not included in this analysis, since no Zone 6 WLAs are being developed as part of this TMDL.

Appendix Figure 6-1. Non-point Source Areas by Zone.

In order to determine what portion of Non-Point Source Runoff volume corresponds to MS4 service areas, we computed both MS4 and non-MS4 runoff volumes for the 19 month continuous simulation period using the methodologies contained in *Urban Hydrology for Small Watersheds, Technical Release 55,* Soil Conservation Service (currently, Natural Resources Conservation Service), June 1986. Appendix Table 6-1 below shows the computation of the composite Curve Number (CN) for both the MS4 and non-MS4 areas by zone. Land use categories corresponding to wetlands and open water were not included in the calculation of composite CNs.

Appendix Table 6-1. Computation of Composite Curve Numbers for MS4 and Non-MS4 Areas by Zone.

	Land Use Value	Land Use Category	area (m^2)	CN	% MS4	MS4 Area (m^2)	Non-MS4 Area (M2)	CN x MS4 Area	Composite MS4 CN	CN x Non-MS4 Area	Composite Non-MS4 CN
zone 2	21	Low Intensity Residential	149,942,000	80	70.00%	104,959,400	44,982,600	8,396,752,000		3,598,608,000	
	22	High Intensity Residential	35,470,900	90	90.00%	31,923,810	3,547,090	2,873,142,900		319,238,100	
	23	Commercial/Industrial/Transportation	51,066,300	94	70.00%	35,746,410	15,319,890	3,360,162,540		1,440,069,660	
	32	Quarries/Strip Mines/Gravel Pits	13,057,200	95	0.00%	0	13,057,200	0		1,240,434,000	
	33	Transitional	3,193,340	91	0.00%	0	3,193,340	0		290,593,940	
	41	Deciduous Forest	110,273,000	76	0.00%	0	110,273,000	0		8,380,748,000	
	42	Evergreen Forest	3,564,690	76	0.00%	0	3,564,690	0		270,916,440	
	43	Mixed Forest	52,161,800	76	0.00%	0	52,161,800	0		3,964,296,800	
	81	Pasture/Hay	180,362,000	79	0.00%	0	180,362,000	0		14,248,598,000	
	82	Row Crops	54,280,000	82	0.00%	0	54,280,000	0		4,450,960,000	
	85	Urban/Recreational Grasses	8,976,360	79	0.00%	0	8,976,360	0		709,132,440	
			662,347,590			172,629,620	489,717,970	14,630,057,440	84.75	38,913,595,380	79.46
zone3	21	Low Intensity Residential	43,022,200	80	70.00%	30,115,540	12,906,660	2,409,243,200		1,032,532,800	
	22	High Intensity Residential	52,358,200	90	90.00%	47,122,380	5,235,820	4,241,014,200		471,223,800	
	23	Commercial/Industrial/Transportation	37,042,800	94	70.00%	25,929,960	11,112,840	2,437,416,240		1,044,606,960	
	32	Quarries/Strip Mines/Gravel Pits	104,987	95	0.00%	0	104,987	0		9,973,765	
	33	Transitional	8,749	91	0.00%	0	8,749	0		796,149	
	41	Deciduous Forest	8,324,080	76	0.00%	0	8,324,080	0		632,630,080	
	42	Evergreen Forest	67,075	76	0.00%	0	67,075	0		5,097,685	
	43	Mixed Forest	2,448,720	76	0.00%	0	2,448,720	0		186,102,720	
	81	Pasture/Hay	1,076,110	79	0.00%	0	1,076,110	0		85,012,690	
	82	Row Crops	1,238,450	82	0.00%	0	1,238,450	0		101,552,900	
	85	Urban/Recreational Grasses	2,780,200	79	0.00%	0	2,780,200	0		219,635,800	
			148,471,571			103,167,880	45,303,691	9,087,673,640	88.09	3,789,165,349	83.64
zone4	21	Low Intensity Residential	118,875,000	80	70.00%	83,212,500	35,662,500	6,657,000,000		2,853,000,000	
	22	High Intensity Residential	30,808,700	90	90.00%	27,727,830	3,080,870	2,495,504,700		277,278,300	
	23	Commercial/Industrial/Transportation	65,573,900	94	70.00%	45,901,730	19,672,170	4,314,762,620		1,849,183,980	
	32	Quarries/Strip Mines/Gravel Pits	1,148,050	95	0.00%	0	1,148,050	0		109,064,750	
	33	Transitional	4,413,330	91	0.00%	0	4,413,330	0		401,613,030	
	41	Deciduous Forest	143,833,000	76	0.00%	0	143,833,000	0		10,931,308,000	
	42	Evergreen Forest	4,900,350	76	0.00%	0	4,900,350	0		372,426,600	
	43	Mixed Forest	46,163,000	76	0.00%	0	46,163,000	0		3,508,388,000	
	81	Pasture/Hay	98,138,200	79	0.00%	0	98,138,200	0		7,752,917,800	
	82	Row Crops	37,478,300	82	0.00%	0	37,478,300	0		3,073,220,600	
	85	Urban/Recreational Grasses	15,321,200	79	0.00%	0	15,321,200	0		1,210,374,800	
			566,653,030			156,842,060	409,810,970	13,467,267,320	85.87	32,338,775,860	78.91
zone5	21	Low Intensity Residential	86,418,600	80	70.00%	60,493,020	25,925,580	4,839,441,600		2,074,046,400	
	22	High Intensity Residential	12,247,500	90	90.00%	11,022,750	1,224,750	992,047,500		110,227,500	
	23	Commercial/Industrial/Transportation	48,787,700	94	70.00%	34,151,390	14,636,310	3,210,230,660		1,375,813,140	
	32	Quarries/Strip Mines/Gravel Pits	5,088,940	95	0.00%	0	5,088,940	0		483,449,300	
	33	Transitional	1,818,800	91	0.00%	0	1,818,800	0		165,510,800	
	41	Deciduous Forest	151,311,000	76	0.00%	0	151,311,000	0		11,499,636,000	
	42	Evergreen Forest	8,114,110	76	0.00%	0	8,114,110	0		616,672,360	
	43	Mixed Forest	62,097,600	76	0.00%	0	62,097,600	0		4,719,417,600	
	81	Pasture/Hay	141,668,000	79	0.00%	0	141,668,000	0		11,191,772,000	
	82	Row Crops	198,928,000	82	0.00%	0	198,928,000	0		16,312,096,000	
	85	Urban/Recreational Grasses	18,823,700	79	0.00%	0	18,823,700	0		1,487,072,300	
			735,303,950			105,667,160	629,636,790	9,041,719,760	85.57	50,035,713,400	79.47

Using the composite CNs for MS4 and Non-MS4 areas and daily 24-hour precipitation totals, we computed daily runoff volumes. The daily 24-hour precipitation totals are daily means of the recorded totals from the Wilmington, Philadelphia, and Neshaminy precipitation gages. As indicated in Appendix Table 6-2 below, only storm events exceeding the computed initial abstraction (Ia) for each area result in runoff. Similarly, only days with measurable precipitation are included in Appendix Table 6-2. We summed the total runoff depth for the 19-month continuous simulation period and multiplied by the area to compute a total runoff volume. We computed the percentage of the total volume associated with the MS4 areas by dividing the MS4 runoff volume by the total of the MS4 and Non-MS4 runoff volumes. The percentage of the MS4 runoff volume is shown at the bottom of Appendix Table 6-2 below.

Appendix Table 6-2. Computation of Runoff Volume Generated by MS4s.

		Zone 2		Zone 3		Zone 4		Zone 5	
		MS4	Non-MS4	MS4	Non-MS4	MS4	Non-MS4	MS4	Non-MS4
	CN	84.75	79.46	88.09	79.46	88.09	83.64	85.87	79.47
	Area (m^2)	172,629,620	489,717,970	103,167,880	45,303,691	156,842,060	409,810,970	105,667,160	629,636,790
	Area (ft^2)	1,858,169,693	5,271,280,154	1,110,489,775	487,644,849	1,688,233,818	4,411,168,398	1,137,391,800	6,777,353,740
	S	1.80	2.58	1.35	2.58	1.35	1.96	1.65	2.58
	Ia	0.36	0.52	0.27	0.52	0.27	0.39	0.33	0.52
Date	Precip. (in)	Runoff (in)							
9/4/2001	0.72	0.060	0.015	0.112	0.015	0.112	0.047	0.075	0.015
9/10/2001	0.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/14/2001	0.63	0.036	0.005	0.077	0.005	0.077	0.027	0.047	0.005
9/20/2001	0.31	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
9/21/2001	0.13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/24/2001	0.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/25/2001	0.22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
…	…	…	…	…	…	…	…	…	…
2/21/2003	0.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2/22/2003	1.96	0.751	0.515	0.936	0.515	0.936	0.696	0.809	0.515
2/23/2003	0.30	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
2/27/2003	0.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2/28/2003	0.05	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/2/2003	0.83	0.099	0.035	0.165	0.035	0.165	0.082	0.118	0.035
3/5/2003	0.34	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000
3/6/2003	0.60	0.029	0.003	0.066	0.003	0.066	0.021	0.039	0.003
3/13/2003	0.04	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/16/2003	0.04	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/17/2003	0.04	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/20/2003	1.55	0.472	0.293	0.620	0.293	0.620	0.429	0.518	0.294
3/21/2003	0.08	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/26/2003	0.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/28/2003	0.03	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/29/2003	0.34	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000
3/30/2003	0.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Runoff (in)	4.997	2.397	7.866	2.397	7.866	4.293	5.818	2.399
	Runoff (ft)	0.416447206	0.199708498	0.655529917	0.199708498	0.655529917	0.357726343	0.484831079	0.199887138
	Runoff (ft3)	773,829,578	1,052,719,443	727,959,270	97,386,821	1,106,687,774	1,577,991,140	551,442,894	1,354,705,843
% of Runoff from MS4		**42%**		**88%**		**41%**		**29%**	

The current MS4 loads for the cycling one year period are calculated using the runoff volume ratio as shown in Appendix Table 6-2 and non-point source runoff loads. Then, proportions of MS4 loads to total loads are calculated. Note that the total loads are defined as sum of point and non-point source loads excluding Trenton and Schuylkill boundary and contaminated site loads for this calculation. The existing MS4 load proportions are summarized in Appendix Table 6-3.

Appendix Table 6-3. Existing loads and proportions of MS4 loads by Zone for the cycling one year period.

Estuary Zone	NPS plus MS4 Loads	MS4 Loads	Total Loads* (Point plus Non-Point sources)	Proportion of MS4 loads to Total Loads*
	kg/365days	kg/365days	kg/365days	%
2	1.545	1.545 x 42 % = 0.649	2.688	24.15
3	0.275	0.275 x 88 % = 0.242	2.376	10.17
4	1.186	1.186 x 41 % = 0.486	3.820	12.73
5	1.129	1.129 x 29 % = 0.327	3.409	9.61

** Total loads, indicated here, are defined excluding Trenton and Schuylkill boundary and contaminated sites loads.*

Appendix Table 6-4 shows the Zone TMDLs excluding Trenton and Schuylkill boundary loads. In addition, the Table contains Zone specific MOS, allocations to contaminated site loads and allocatable portion to the rest of point and non-point source categories. The allocations to MS4s are calculated by proportion of MS4 loads to Total Loads shown in Appendix Table 6-3 and Allocatable portion to the rest of categories shown in Appendix Table 6-4. Summary of categorical WLAs and LAs are presented in Table 9 and Table 10 of the main text.

Appendix Table 6-4. Summary of the Zone TMDLs for penta-PCBs excluding Trenton and Schuylkill boundaries.

Estuary Zone	TMDL	MOS	Contaminated Site	Allocatable portion to the rest of categories	Allocations to MS4s
	mg/day	mg/day	mg/day	mg/day	mg/day
Zone 2	6.613	0.331	0.026	6.256	1.511
Zone 3	4.455	0.223	2.416	1.816	0.185
Zone 4	4.569	0.228	1.651	2.689	0.342
Zone 5	12.016	0.601	5.250	6.165	0.592

Exhibit F

DRBC Updates PCB and pH Water Quality Criteria for Delaware River and Bay

Related Links

PCB Information

Toxics Advisory Committee Information

Water Quality Advisory Committee Information

For Immediate Release

December 4, 2013

(WASHINGTON CROSSING, Pa.) -- The Delaware River Basin Commission (DRBC) at its December 4, 2013 business meeting adopted updated water quality criteria for polychlorinated biphenyls (PCBs) in the Delaware Estuary and Bay and also for pH in interstate tidal and non-tidal reaches of the main stem Delaware River.

The updated PCB criteria for the protection of human health from carcinogenic effects is 16 picograms/liter. This number, based upon the most current methodology and scientific data available, is now a uniform value for the entire Delaware Estuary and Bay (DRBC Water Quality Zones 2-6). The criteria previously varied according to the water quality zone, differed from that of the basin states, and did not take into account site-specific data and current U.S. Environmental Protection Agency (U.S. EPA) guidance on the development of human health criteria.

This update was originally proposed in 2009, but action was deferred pending further refinement of an implementation strategy to support achievement of the revised PCB water quality criteria. While comment on an updated implementation strategy was solicited simultaneously with the current PCB criteria revision, there was no planned commission action on the strategy.

The Delaware Estuary and Bay are considered impaired for PCBs, and the U.S. EPA has established total maximum daily loads (Stage I TMDLs) for these waterbodies. A TMDL expresses the maximum amount of a pollutant that a waterway can receive and still attain water quality standards. With DRBC's adoption of revised PCB criteria, it is anticipated that the U.S. EPA will establish new TMDLs (Stage 2 TMDLs) corresponding to the updated criteria. In the associated report announcing the Stage 2 TMDLs, the U.S. EPA will include the proposed implementation strategy as an appendix and will solicit comment on the report and strategy in 2014.

PCBs have been classified by the U.S. EPA as a probable human carcinogen. The U.S. banned the manufacture and general use of PCBs in the late 1970s, but not before 1.5 billion pounds of the substance was produced.

The updated PCB criteria was developed under the guidance of the commission's Toxics Advisory Committee, comprised of representatives of the four basin states - Delaware, New Jersey, New York, and Pennsylvania - and members of the academic, agricultural, public health, industrial and municipal sectors, and non-governmental environmental community. The rulemaking was noticed in the federal and state registers, with the full text of the proposed rule changes and related materials posted on the DRBC web site on August 1, 2013. A public hearing was held on September 10, with written comments accepted through September 20.

The commissioners at the December 4 meeting, which was held at the Washington Crossing Historic Park Visitor Center, also adopted revised pH water quality criteria for the main stem Delaware River and tidal tributaries up to the head of tide. DRBC's pH criteria have not been updated since being established in 1967. The old pH criteria were expressed as ranges and were different for the tidal (between 6.5 and 8.5) and non-tidal (between 6 and 8.5) river. The approved criteria range (between 6.5 and 8.5) is now uniform for the entire main stem Delaware (except towards natural conditions in certain sections of the river), minimizes regulatory inconsistencies between DRBC criteria and that of the basin states and the U.S. EPA, and better addresses natural pH cycles in the main stem Delaware River.

The revisions to the pH criteria were unanimously endorsed by the DRBC's Water Quality Advisory Committee, comprised of regulators, municipal and industrial dischargers, academicians, and environmental organizations, which advises the commissioners on technical matters relating to water quality within the basin. The rulemaking was noticed in the federal and state registers, with the full text of the proposed rule changes and related materials posted on the DRBC web site on September 20, 2013. A public hearing was held on October 24, with written comments accepted through November 21.

Additional information is available on the commission's web site at www.drbc.net.

The DRBC was formed by compact in 1961 through legislation signed into law by President John F. Kennedy and the governors of the four basin states with land draining to the Delaware River. The passage of this compact marked the first time in our nation's history that the federal government and a group of states joined together as equal partners in a river basin planning, development, and regulatory agency.

***

Contact: Kate Schmidt, 609-883-9500 ext. 205, kate.schmidt@drbc.state.nj.us

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Exhibit G

DEPARTMENT OF THE ARMY PERMIT

PERMITTEE AND PERMIT NUMBER:

CENAP-OP-R-2016-0181-39: Delaware River Partners, LLC

ISSUING OFFICE:

Department of the Army
U.S. Army Corps of Engineers, Philadelphia District
Wanamaker Building - 100 Penn Square East
Philadelphia, Pennsylvania 19107-3390

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

PROJECT DESCRIPTION:

Activities authorized per Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act of 1899 include the construction of a proposed new docking facility consisting of two (2) loading platforms, eight breasting dolphins, 11 mooring dolphins, walkways to provide access between the loading platforms and dolphins, a trestle supporting a one-lane vehicular roadway with adjacent pedestrian access and an internal pipe system for the transfer bulk liquid product (including Liquefied Natural Gas (LNG)), and mechanical dredging in the waterway

Loading Platforms

Two loading platforms, 138.5' x 85' in size, will be constructed to allow for loading bulk liquid product onto vessels. Each loading platform will be constructed on forty 30" diameter steel pipe piles (80 piles total). The loading platforms will be connected to the trestle by an 88.5' by 45' structure supported by fourteen 24" steel pipe piles. The location of the loading platforms are shown on the attached plan sheets.

Trestle

Access to the loading platforms from land will be provided by a 36' wide trestle supporting a one-lane vehicular roadway with adjacent pedestrian access, an internal pipe system for the transfer bulk liquid product, and mechanical and electrical support systems. The trestle will extend waterward from the mean high water line for approximately 660'. At that point, the trestle will turn west and run parallel to the loading platforms, dolphins, and walkways for approximately 1611'. The trestle will be supported by 4 pile supported bents, with a total of 210 24" diameter steel wall pipe piles over 50 bents.

These pipelines, which go from the trestle to the loading platforms, will vary in size and contain multiple products, including bulk liquids, water, nitrogen electricity and fire retardant.

A 50' wide abutment will support the landing of the trestle above the mean high water line. A sheet pile wall will be constructed around the abutment to provide additional structural support (total length 147 feet).

Dolphins

In order to secure the vessels at the site, 11 mooring dolphins (including one shared mooring dolphin) and eight (8) breasting dolphins will be installed. Both the mooring and breasting dolphins will be 33' square. The shared mooring dolphin will be 57' by 33'.

The typical mooring dolphin will be constructed on nine 48" diameter steel wall pipe piles. The shared mooring dolphin will be constructed on fifteen 48" diameter steel pipe piles (95 total piles). The breasting dolphins will be constructed on eight 48" diameter steel pipe piles (64 total piles).

Walkways

Walkways will be installed between the loading platforms and dolphins to provide access from the platforms to the dolphins. Eleven 48" steel pipe piles will be installed to support all 1640 linear feet of the 5' wide walkways. Walkways between loading platforms, mooring dolphins, and breasting dolphins will be provided with four intermediate support systems.

The overall length of the structure, including the mooring dolphins will be 2550 linear feet. The waterward most structure will be located approximately 650' from the edge of the Federal Navigation Channel. Lighting fixtures on the structures will be installed as required by the US Coast Guard.

Mechanical Dredging

An area approximately 45 acres in size will be dredged to a depth of -43 feet mean lower low water ± 1 foot overdraft. The material, composed primarily of a silt and clay, will be removed using mechanical excavation equipment. A closed environmental mechanical bucket will be used primarily to excavate the silt layer from the waterway. The bucket will remain closed over the water while the majority of the water drains from the excavated material. The dredged material will then be placed in a hopper barge and allowed to decant, with the excess water returning to the waterway. Sediment testing confirms that the material meets the New Jersey Department of Environmental Protection's requirements with regard to contaminant levels. One option would be for the material to be taken directly to the Whites Basin Confined Disposal Facility (CDF) located in Logan Township, Gloucester County, New Jersey. A second option will be to load the material onto a barge and transported to the Fort Mifflin CDF, located in the City of Philadelphia, Philadelphia County, Pennsylvania. A separate permit will need to be obtained from the US Army Corps of Engineers, Operation Division before any material will be accepted at the Fort Mifflin CDF. For material destined for the Whites Basin facility, the dredged material will be placed directly into bottom-dump barges. These barges will then be transported by tugboat to the Whites Basin and discharged into the Basin in accordance with their operating permits. For material approved by the Corps for the Ft. Mifflin site, the dredged material will be mechanically dredged and placed directly into hopper barges. The hopper scows will then be transported by tugboat across the channel to a hydraulic unloader positioned on a spud barge located adjacent to the Ft. Mifflin CDF site. There, the material will be hydraulically unloaded from the hopper scows directly into one of the upland CDF cells at Ft. Mifflin. A total of approximately 665,000 cubic yards of material will be removed from the waterway. It is also noted that some of the materials dredged from the Delaware River may be used as fill for the development activities on the site.

Equipment to be used at the site for the proposed construction activities described herein will be located no closer than 50 feet from the edge of the Federal navigation channel. Remnants of an existing structure constructed approximately 100 years ago will remain in place and not be impacted by the work proposed at the site.

All work is to be completed in accordance with the attached plan(s) E-1 through E-22

PROJECT LOCATION:

Block 8, Lots 2, 3, 4, 4.01 and 4.02, in the Gibbstown Section of Greenwich Township, Gloucester County, New Jersey

PERMIT CONDITIONS:

General Conditions:

1. The time limit for completing the work authorized ends on December 31, 2024. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. All work performed in association with the above noted project shall be conducted in accordance with the project plans entitled "DRP Gibbstown Logistics Center Dock 2", prepared by Moffatt and Nichol, 11, 11A, 12, 12A, 15 through 20 dated February 22, 2019, last revised August 16, 2019, sheet 13 dated February 22, 2019 last revised December 2, 2019, sheet 14 dated February 22, 2019, last revised December 2, 2019. The project plans provide for the dredging of approximately 45 acres of the waterway to a depth of minus 43 feet mean lower low water ± 1 foot. Docking facilities will be constructed at the site as indicated above.

2. Construction activities shall not result in the disturbance or alteration of greater than 47 acre of waters of the United States.

3. Any deviation in construction methodology or project design for activities in waters of the United States from that shown on the above noted drawings must be approved by this office, in writing, prior to performance of the work. All modifications to the above noted project plans shall be approved, in writing, by this office. No work shall be performed prior to written approval of this office.

4. This office shall be notified at least 10 days prior to the commencement of authorized work by completing and signing the attached Notification/ Certification of Work Commencement Form. This office shall also be notified within 10 days of the completion of the authorized work by completing and signing the attached Notification/Certification of Work Completion/Compliance Form. All notifications required by this condition shall be in writing and shall be transmitted to this office by registered mail. Oral notifications are not acceptable. Similar notification is required each time maintenance work is to be done under the terms of this Corps of Engineers permit.

5. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

6. A minimum of 30 days prior to commencing work, the permittee/contractor shall request in writing, from the U.S. Coast Guard, that a Local Notice to Mariners be issued regarding the

authorized construction work. This written request shall include the location of work, a description of the construction activities; type of construction equipment to be used and expected duration of work in the waterway. The written request should be addressed to the following: Mr. Ward B. Posey Local Notice to Mariners Fifth Coast Guard District 431 Crawford Street Portsmouth, Virginia 23704-5004 (757) 398-6229 Ward.B.Posey@uscg.mil
A copy of the cover letter shall be forward to our office for our records.

7. In order to avoid impacts to anadromous fisheries resources, no in-water work shall occur between March 15th and June 30th of any given year. If future work is requested during the seasonal restriction, this office will re-coordinate with the National Marine Fisheries Service (NMFS) and no in-water work will be allowed until coordination with the NMFS is complete.

8. In order to avoid impacts to Atlantic Sturgeon (Acipenser oxyrhynchus oxyrhynchus), no in-water work shall occur between March 15th and September 15th of any year to ensure impacts to the larval phase of will be minimal. If future work is requested during the seasonal restriction, this office will re-coordinate with the National Marine Fisheries Service (NMFS) and no in-water work will be allowed until coordination with the NMFS is complete. If the carcass of an Atlantic or Shortnose sturgeon is noted within the waters surrounding the port facility, the sighting must be reported to NMFS within 24 hours at incidental.take@noaa.gov

9. To minimize impacts to the fisheries resources, a "soft start", which involves having the hammer (both vibratory and impact) commencing work at half power, shall be employed, for a minimum of 15 minutes. After this time period, the hammer can be used at full power.

10. At least 30 days prior to the commencement of work within areas of Federal jurisdiction, a pre-construction meeting must be held with the permittee, their contractors, and representatives of this office to insure that all permit conditions are fully understood by the permittee and their contractors.

11. An environmental bucket shall be used for the removal of accumulated sediment at the site. The permittee shall monitor the descent of the bucket, and ensure that it is used in such a manner that the bucket will not penetrate beyond the vertical dimension of the bucket. The permittee shall minimize the loss of sediment due to extrusion through the bucket vent openings and hinge area.

12. In order to minimize sedimentation of the waterway during removal of accumulated sediment, the environmental bucket shall be operated in a manner that will minimize the number of passes required to remove the sediment and shall not be dragged over the substrate. Additionally, the rate of removal of the bucket from the river shall be performed at a rate no greater than 2 feet per second.

13. Any hydraulically dredged material pumped via pipeline to the Whites Basin CDF shall be placed within a basin located on the upland portions of the facility. The material shall not be discharged directly into the re-handling basin.

14. The pipeline conveying the dredged material shall be located no closer than 100 feet from the edge of the Federal navigation channel as shown on local navigation charts.

15. In the event that the permittee selects to dispose of any dredged materials at the Fort Mifflin dredged material disposal facilities, they shall contact Mr. Timothy Rooney of the Philadelphia District Operations Division by calling (215-656-6592) or by e-mail at (timothy.j.rooney@usace.army.mil) a minimum of 30 days prior to the proposed commencement of dredging activities to verify availability of the Fort Mifflin Confined Disposal Site (CDF) for the dredged materials and to finalize any other details relating to the placement/handling of the dredged materials.

16. In the event that the permittee selects to dispose of any dredged materials at the Fort Mifflin CDF, the permittee shall obtain a Water Quality Certificate (WQC) from the Pennsylvania Department of Environmental Protection (PADEP) prior to any disposal activities. It is the permittee's responsibility to ensure that all material to be placed at the Fort Mifflin CDF site shall meet all requirements, including a site specific Water Quality Certification, from the PADEP.

17. Any disposal of dredged materials at the Fort Mifflin CDF shall be conducted in accordance with the stipulations in Department of the Army Real Estate License Number DACW-31-3-17-316 between the US Army Corps of Engineers, Baltimore District, Real Estate Division and CLEAN EARTH DREDGING TECHNOLOGIES, LLC, 334 S. Warminster Road, Hatboro, Pennsylvania 19040, (Granted March 10, 2017). Particular attention is directed to the stipulation (Section 2 a.) requiring that the permittee remove 1.5 times the volume of any material to be placed within the CDF, by measure, prior to the disposal of any dredged materials into the CDF. Bathymetric surveys must be performed both prior to and after dredging to confirm the amount of material placed at the Fort Mifflin CDF. All survey work shall be performed at the permittee's expense.

18. The decision to issue this permit was partially based upon the proposal for truck traffic accessing the port via the Gloucester County Route 44 by-pass in order to minimize traffic impacts to the community. As such, trucks containing Liquefied Natural Gas shall not access the site other than from the by-pass. Should the development of the by-pass be delayed or abandoned, you shall contact this office and no work shall begin until this office has re-evaluated traffic impacts to the community.

19. No pile driving can be performed until this office receives and approves the design for a bubble curtain that will be used to minimize sound generated by the work in the waterway.

FURTHER INFORMATION:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

☒ Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

☒ Section 404 of the Clean Water Act (33 U.S.C. 1344).

☐ Section 103 of the Marine Protection, Research and Sanctuaries Act.

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

2/25/20

(PERMITTEE) (DATE)

Agent on behalf of
Delaware River Partners LLC

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

25 Feb 2020

(District Engineer) (DATE)
Edward E. Bonner, Chief, Regulatory Branch

for: David C. Park
Lieutenant Colonel, Corps of Engineers
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (DATE)

5. If a conditioned water quality certification has been issued for your project, you must comply with conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. All work performed in association with the above noted project shall be conducted in accordance with the project plans entitled "DRP Gibbstown Logistics Center Dock 2", prepared by Moffatt and Nichol, 11, 11A, 12, 12A, 15 through 20 dated February 22, 2019, last revised August 16, 2019, sheet 13 dated February 22, 2019 last revised December 2, 2019, sheet 14 dated February 22, 2019, last revised December 2, 2019. The project plans provide for the dredging of approximately 45 acres of the waterway to a depth of minus 43 feet mean lower low water ± 1 foot. Docking facilities will be constructed at the site as indicated above.

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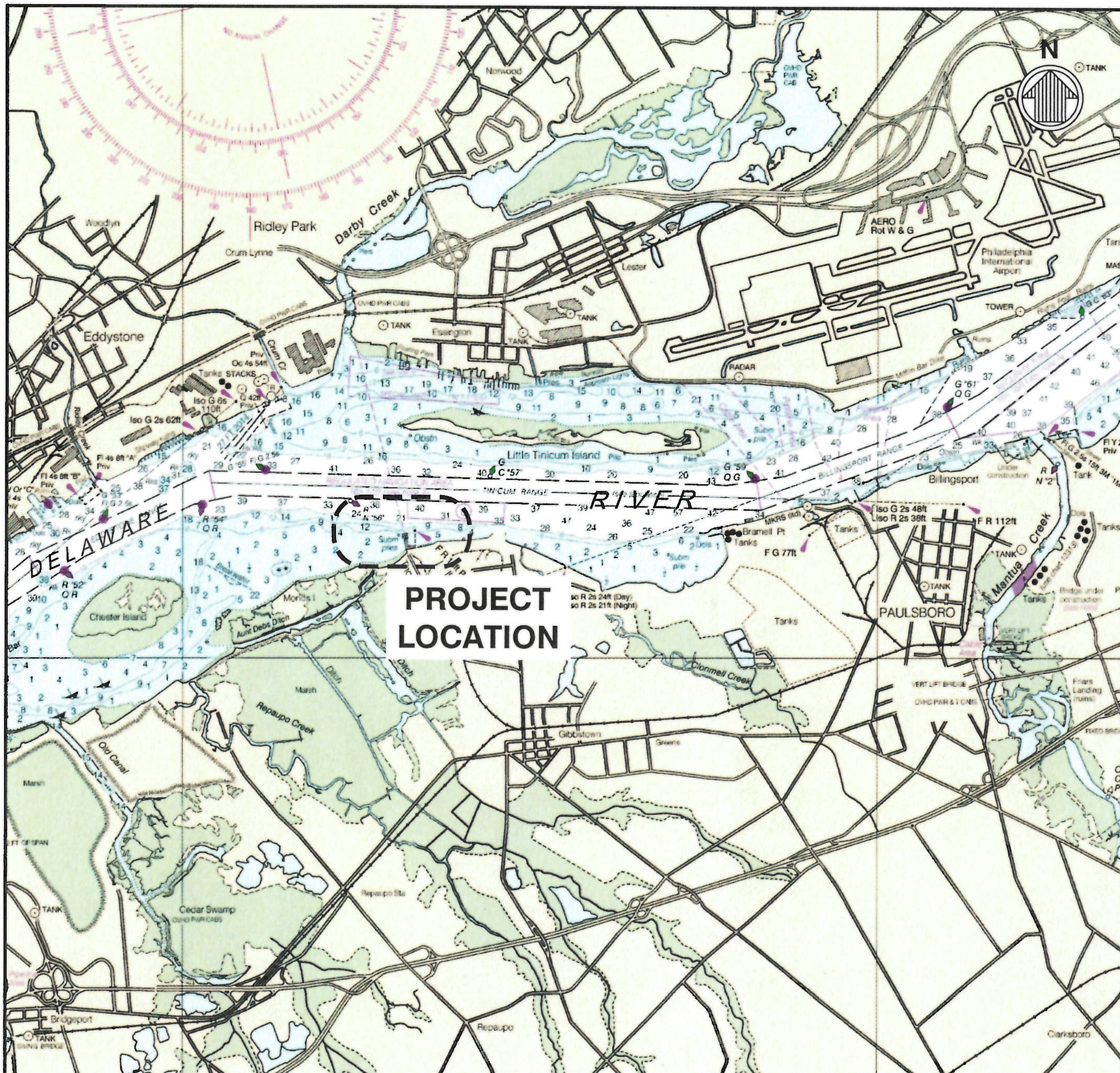
4. This office shall be notified at least 10 days prior to the commencement of authorized work by completing and signing the attached Notification/ Certification of Work Commencement Form. This office shall also be notified within 10 days of the completion of the authorized work by completing and signing the attached Notification/Certification of Work Completion/Compliance Form. All notifications required by this condition shall be in writing and shall be transmitted to this office by registered mail. Oral notifications are not acceptable. Similar notification is required each time maintenance work is to be done under the terms of this Corps of Engineers permit.

5. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

6. A minimum of 30 days prior to commencing work, the permittee/contractor shall request in writing, from the U.S. Coast Guard, that a Local Notice to Mariners be issued regarding the



VICINITY MAP

NOTE:

BACKGROUND TAKEN FROM NOAA CHART 12312, 58TH ED., NOVEMBER 2018.

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

2500' 0' 2500' 5000'

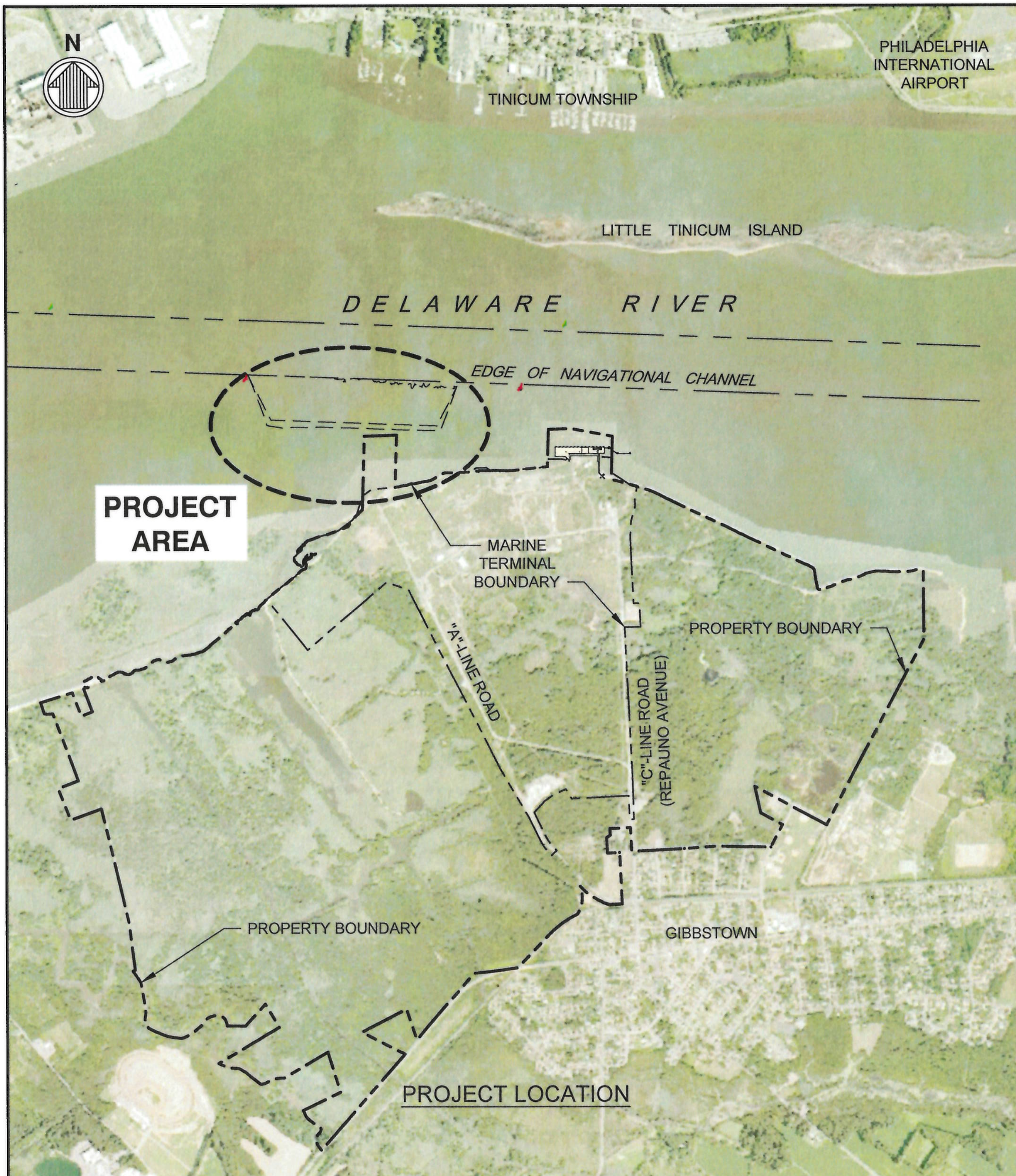
SCALE: 1"=5000'

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

SHEET 01 OF 20

File: Q:\BA\10377 DRP Energy FD\500 CADD_ACTIVE_Permits_USACE Dock2_SheetSet\103770P-001 ; Plotted: 8/15/2019 4:57 PM by VOELKER, PAUL ; Saved: 8/15/2019 1:43 PM by PVOELKER

E-1



APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

1000' 0' 1000' 2000'

SCALE: 1"=2000'

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

SHEET 02 OF 20

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GENERAL NOTES

1. NOTES BELOW ARE NOT INTENDED TO REPLACE SPECIFICATIONS. SEE SPECIFICATIONS FOR REQUIREMENTS IN ADDITION TO GENERAL NOTES.

2. EXISTING CONDITIONS SURVEY SHOWN IS BASED ON A REPORT OF TITLE PREPARED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY, TITLE NO. 2013-80667, REVISED TO FEBRUARY 13, 2015 AND IS SUBJECT TO THE CONDITIONS AND RESTRICTIONS LISTED THEREON THE TITLE REPORT AND SEVERAL NOTED UNRECORDED DOCUMENTS WERE SUPPLIED BY E.I. DU PONT DE NEMOURS AND COMPANY.

3. EXISTING CONDITIONS ARE ALSO BASED IN PART ON A FORMER SURVEY OF THE ENTIRE TRACT PERFORMED FOR E.I. DU PONT DE NEMOURS AND COMPANY DATED 12/15/2000 PREPARED BY CONSULTING ENGINEERING SERVICES, FOUND MONUMENTATION, PHYSICAL EVIDENCE, DEEDS OF RECORD, AND TAX MAP INFORMATION.

4. EXISTING BUILDINGS AT THE SITE NOT DESIGNATED "TO REMAIN" HAVE BEEN DEMOLISHED TO FOUNDATION LEVEL AFTER SITE SURVEY WAS PERFORMED.

5. BUILDING SURFACE AND SUBSURFACE IMPROVEMENTS ON OR ADJACENT TO THE SITE ARE NOT NECESSARILY SHOWN.

6. THE LOCATIONS OF UNDERGROUND UTILITIES MAY VARY FROM THE LOCATIONS ILLUSTRATED. THE UTILITIES WERE MAPPED FROM RECORD PLANS PROVIDED BY DU PONT AND ORIENTED TO PHYSICAL FEATURES ILLUSTRATED ON THE RECORD PLANS. SITE IMPROVEMENTS/INFRASTRUCTURE MAY NOT BE SHOWN BECAUSE OF LACK OF DEFINED RECORDS. A DETAILED SUBSURFACE INVESTIGATION TO VERIFY PRESENCE OF UNDERGROUND STRUCTURES/UTILITIES MUST BE PERFORMED PRIOR TO ANY EXCAVATION OR CONSTRUCTION.

7. THE VERTICAL DATUM IS BASED UPON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). THE HIGH TIDE LINE (HTL) IS DEFINED AS MEAN HIGHER HIGH WATER WHICH IS ELEV +3.14 FT.

REPAUNO DESIGN DATUM - NAVD88	
HIGHEST OBSERVED WATER LEVEL *	7.14 FEET
HIGH TIDE LINE (HTL)	3.14 FEET
MEAN HIGH WATER (MHW)	2.77 FEET
MEAN SEA LEVEL (MSL)	0.13 FEET
NORTH AMERICAN VERTICAL DATUM (NAVD88)	0.00 FEET
MEAN TIDE LEVEL (MTL)	-0.02 FEET
MEAN LOW WATER (MLW)	-2.82 FEET
MEAN LOWER LOW WATER (MLLW)	-3.00 FEET
LOWEST OBSERVED WATER LEVEL	-6.52 FEET

* THE "HIGHEST OBSERVED WATER LEVEL" WAS RECORDED BY NOAA (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION) ON OCTOBER 30, 2012 WHEN HURRICANE SANDY WAS CROSSING THE DELAWARE RIVER NEAR WILMINGTON, DE.

8. THE TOPOGRAPHIC SURVEY ILLUSTRATED IN THIS PLAN SET WAS PERFORMED DURING A TIME PERIOD WHERE THE GROUND WAS OBSCURED IN LARGE PART BY VEGETATIVE COVER. THE FINAL TOPOGRAPHY WAS DEVELOPED FROM A COMBINATION OF DATA SOURCES INCLUDING NEW LIDAR DATA ACQUIRED IN JULY, 2014; AERIAL PHOTOGRAPHY DATED JULY, 2014; NEW ORTHOPHOTOGRAPHY DATED JULY, 2014; NJ STATE LIDAR DATA OBTAINED IN THE SPRING OF 2007; NJ STATE ORTHOPHOTOGRAPHY (2012); PLANIMETRIC DETAIL ON A SURVEY BY CONSULTING ENGINEERING SERVICES, DATED DECEMBER 15, 2000. THIS TOPOGRAPHIC SURVEY SHOULD NOT BE USED FOR FINAL DESIGN OR EARTHWORK CALCULATIONS WITHOUT FIELD VERIFICATION OF THE ELEVATIONS.

9. THE HYDROGRAPHIC SURVEY ILLUSTRATED IN THIS PLAN SET WAS PERFORMED IN DECEMBER 2014 AND UPDATED IN NOVEMBER 2018 BY GAHAGAN & BRYANT ASSOCIATES, INC.

10. HIGH TIDE LINE SHOWN ON PLANS IS ELEV +3.14 FT, EXCEPT WHERE THERE IS AN EXISTING BULKHEAD, PIER OR TIDE GATE. THIS LINE DEFINES THE MEAN HIGHER HIGH WATER LINE AND LIMIT OF WATERS OF THE U.S (WOTUS).

11. SURVEY BASED ON THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 1983. THE COORDINATES SHOWN HEREON WERE DERIVED FROM A VIRTUAL REFERENCE STATION (VRS) NETWORK (KEYNET GPS) USING TRIMBLE'S VRS NET APP SOFTWARE.

INDEX OF DRAWINGS

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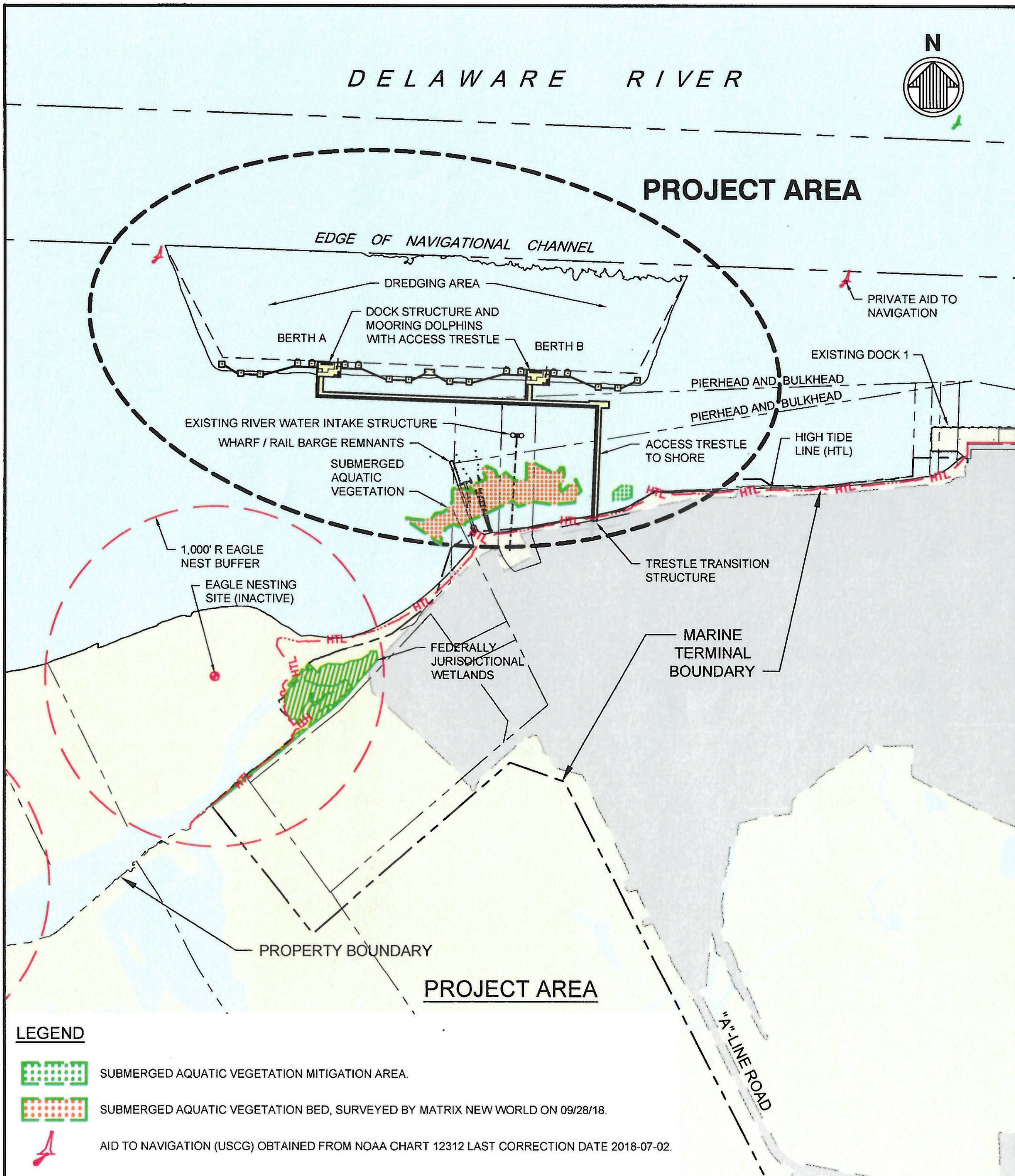
APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	DATE: MARCH 20, 2019 REISSUE: AUGUST 16, 2019 SHEET 03 OF 20



APPLICATION BY:	DRP GIBBSTOWN	
DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027	LOGISTICS CENTER DOCK 2	400' 0' 400' 800' SCALE: 1"=800'
ENGINEER: moffatt & nichol	PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 04 OF 20

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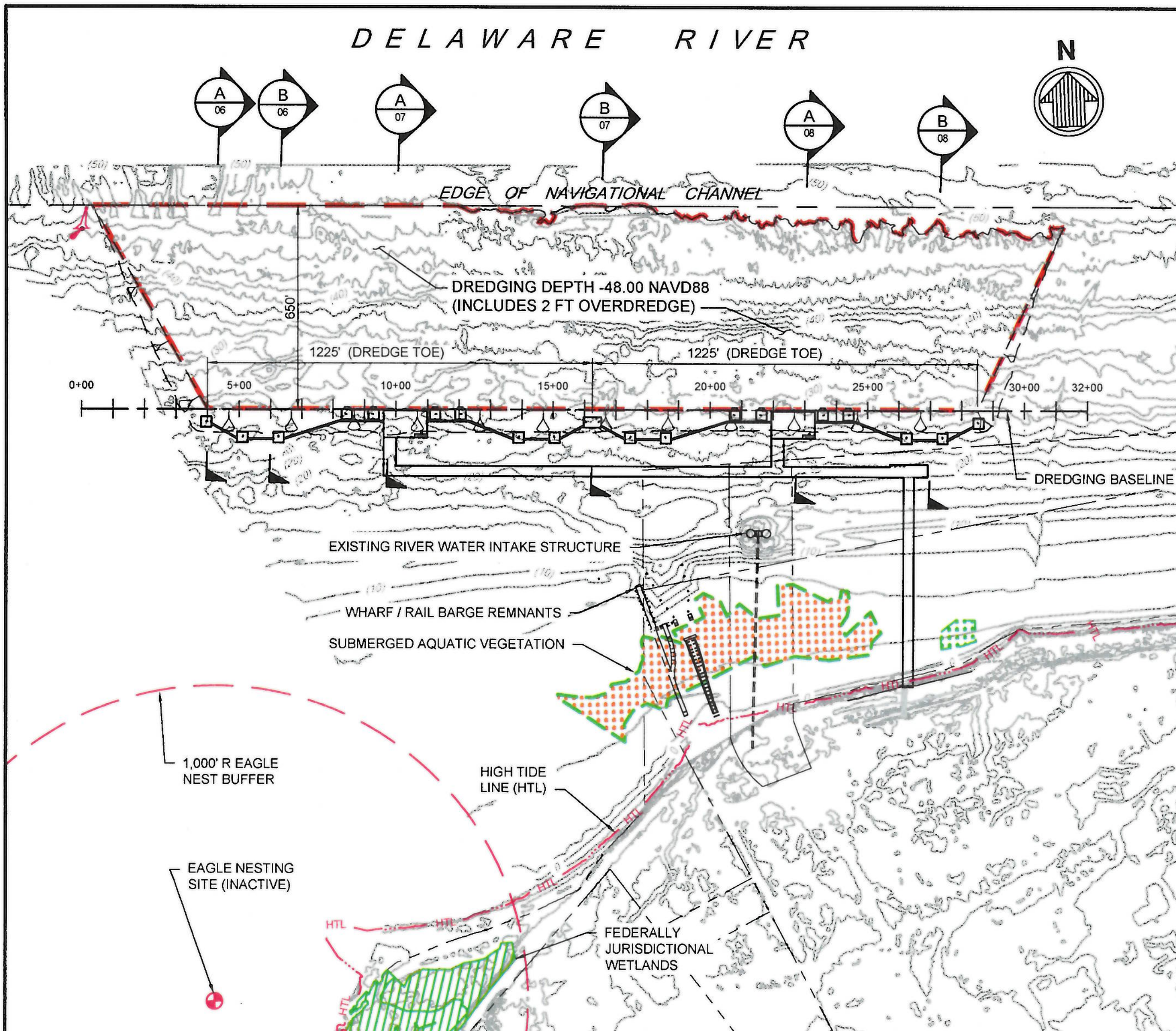
E-4



PLAN - DREDGING

LEGEND

- NEW DREDGING AREA (39.56 AC).
- SUBMERGED AQUATIC VEGETATION MITIGATION AREA.
- SUBMERGED AQUATIC VEGETATION BED, SURVEYED BY MATRIX NEW WORLD ON 09/28/18.
- AID TO NAVIGATION (USCG) OBTAINED FROM NOAA CHART 12312 LAST CORRECTION DATE 2018-07-02.

NOTES:

1. DREDGING AREA MEASURED TO TOE OF SLOPE.
2. DREDGED SLOPE IS 3:1.

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

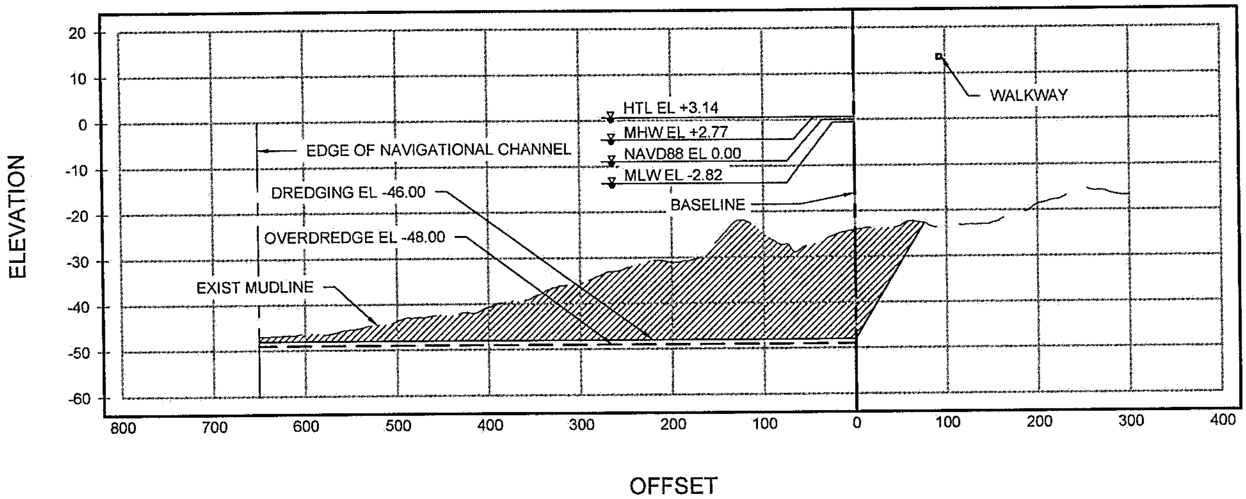
500' 0' 500' 1000'
SCALE: 1"=500'

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

SHEET 05 OF 20

File: Q:\BA\10377 DRP Energy FD\500 CADD_ACTIVE_Permits_USACE Dock2_SheetSet\103770P-005 ; Plotted: 8/15/2019 4:58 PM by VOELKER, PAUL ; Saved: 8/15/2019 2:47 PM by PVOELKER

E-5



B
05
SECTION - DREDGING @ STA 6+00
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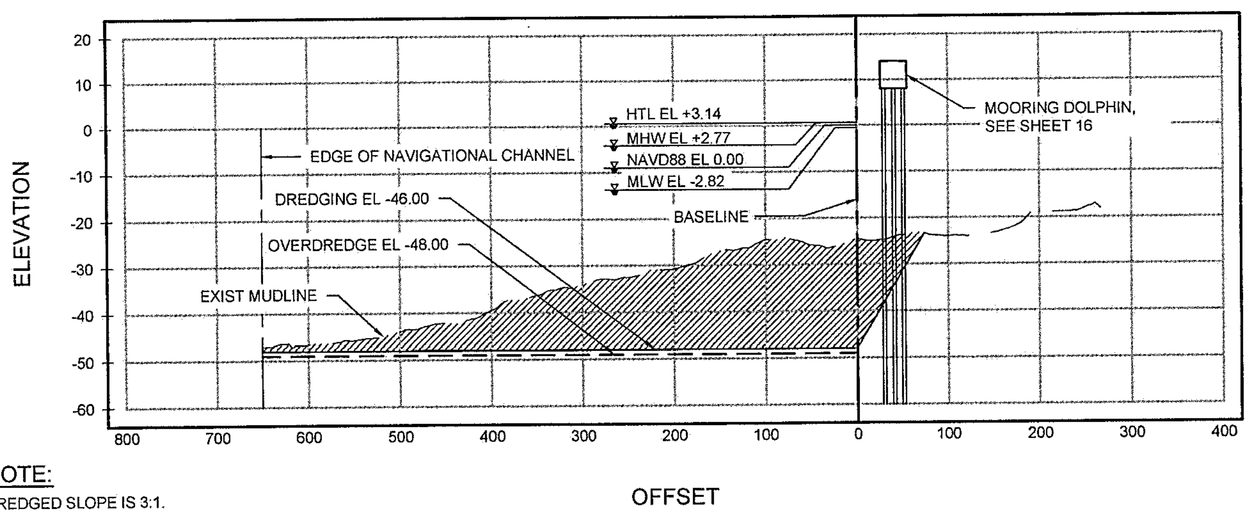

NOTE:
DREDGED SLOPE IS 3:1.

A
05
SECTION - DREDGING @ STA 4+00
SCALE: 1"=200' H / 1"=40' V

SECTIONS - DREDGING SHEET 1 OF 3

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

200' 0' 200' 400'
SCALE: 1"=200'
40' 0' 40' 80'
SCALE: 1"=40'

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

SHEET 06 OF 20

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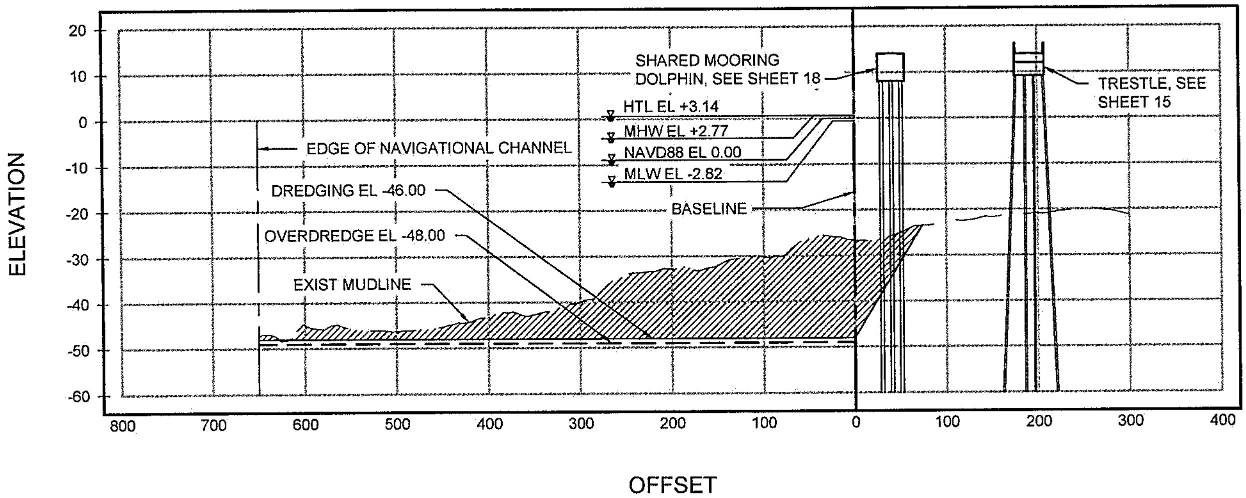

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SECTION - DREDGING @ STA 16+25
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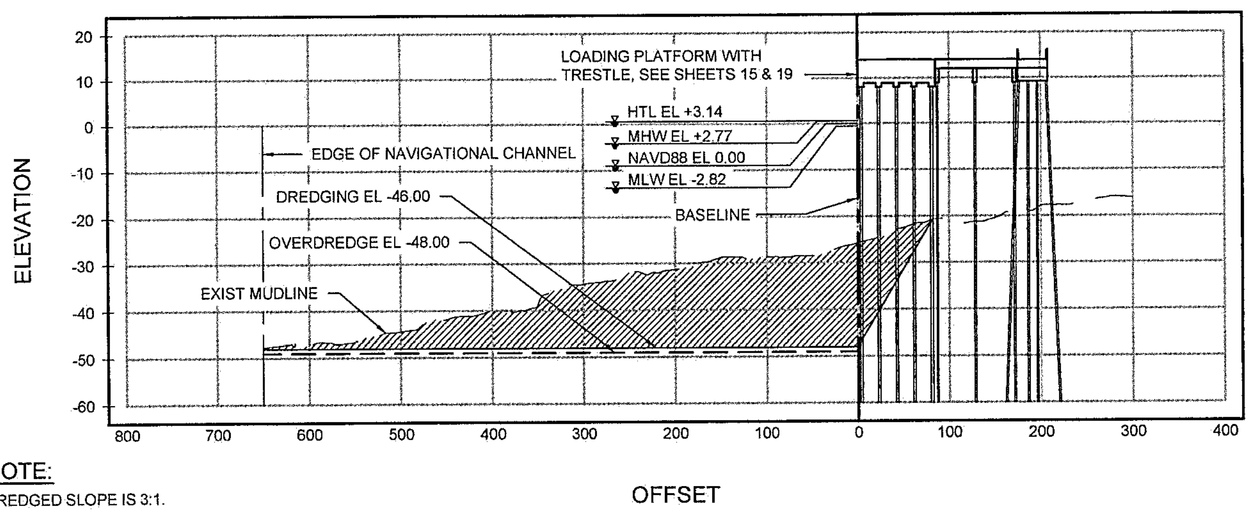

NOTE:
DREDGED SLOPE IS 3:1.

A
05
SECTON - DREDGING @ STA 9+75
SCALE: 1"=200'H / 1"=40' V

SECTIONS - DREDGING SHEET 2 OF 3

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	200' 0' 200' 400' SCALE: 1"=200' 40' 0' 40' 80' SCALE: 1"=40' DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 07 OF 20

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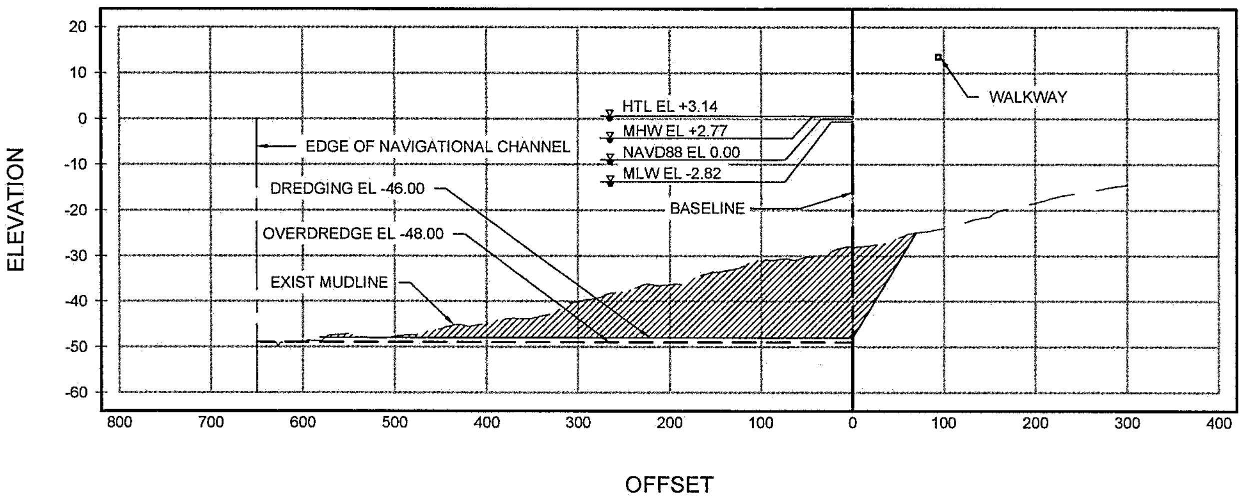

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05
SECTION - DREDGING STA 27+00
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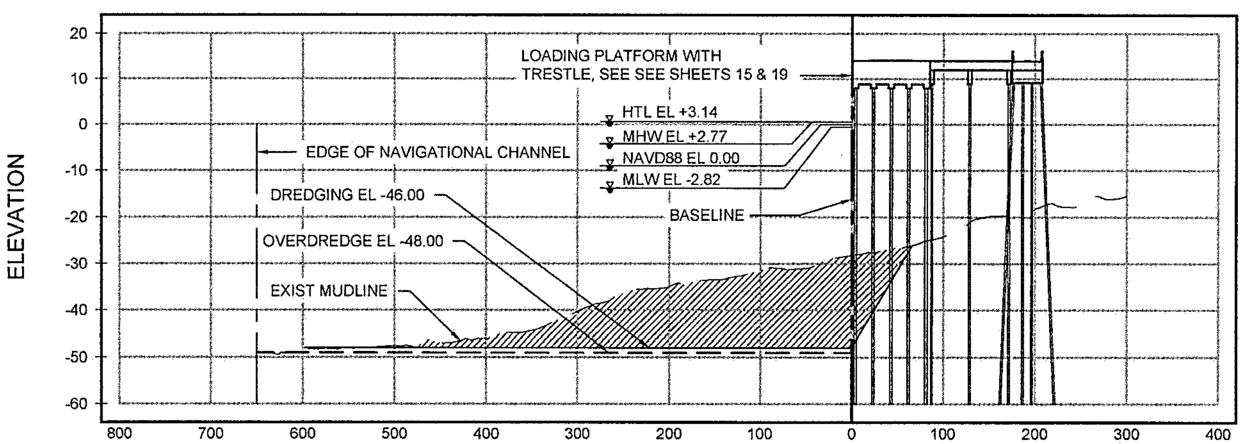

NOTE:
DREDGED SLOPE IS 3:1.

OFFSET

A
05
SECTION - DREDGING @ STA 22+75
SCALE: 1"=200' H / 1"=40' V

SECTIONS - DREDGING SHEET 3 OF 3

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2	200' 0' 200' 400' SCALE: 1"=200'; 40' 0' 40' 80' SCALE: 1"=40'
ENGINEER: moffatt & nichol	PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 08 OF 20

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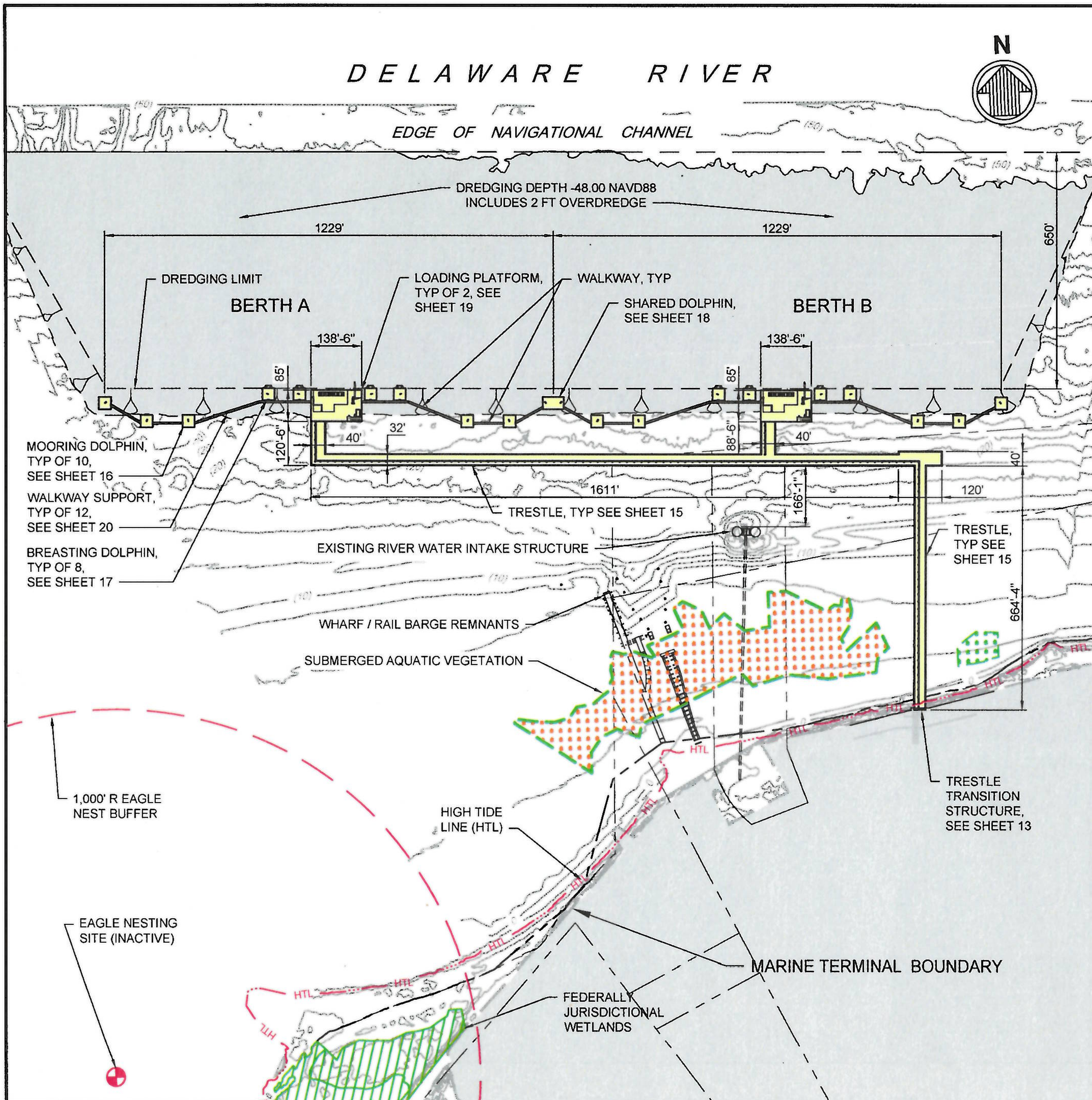
E-8



PLAN - GENERAL ARRANGEMENT BERTH A AND BERTH B

SUBMERGED AQUATIC VEGETATION MITIGATION AREA.

SUBMERGED AQUATIC VEGETATION BED, SURVEYED BY MATRIX NEW WORLD ON 09/28/18.

AID TO NAVIGATION (USCG) OBTAINED FROM NOAA CHART 12312 LAST CORRECTION DATE 2018-07-02.

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	200' 0' 200' 400' SCALE: 1"=400' DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 09 OF 20

File: Q:\BA\10377 DRP Energy FD\500 CADD_ACTIVE_Permits_USACE Dock2_SheetSet\103770P-009 ; Plotted: 8/15/2019 4:59 PM by VOELKER, PAUL ; Saved: 8/15/2019 2:50 PM by PVOELKER

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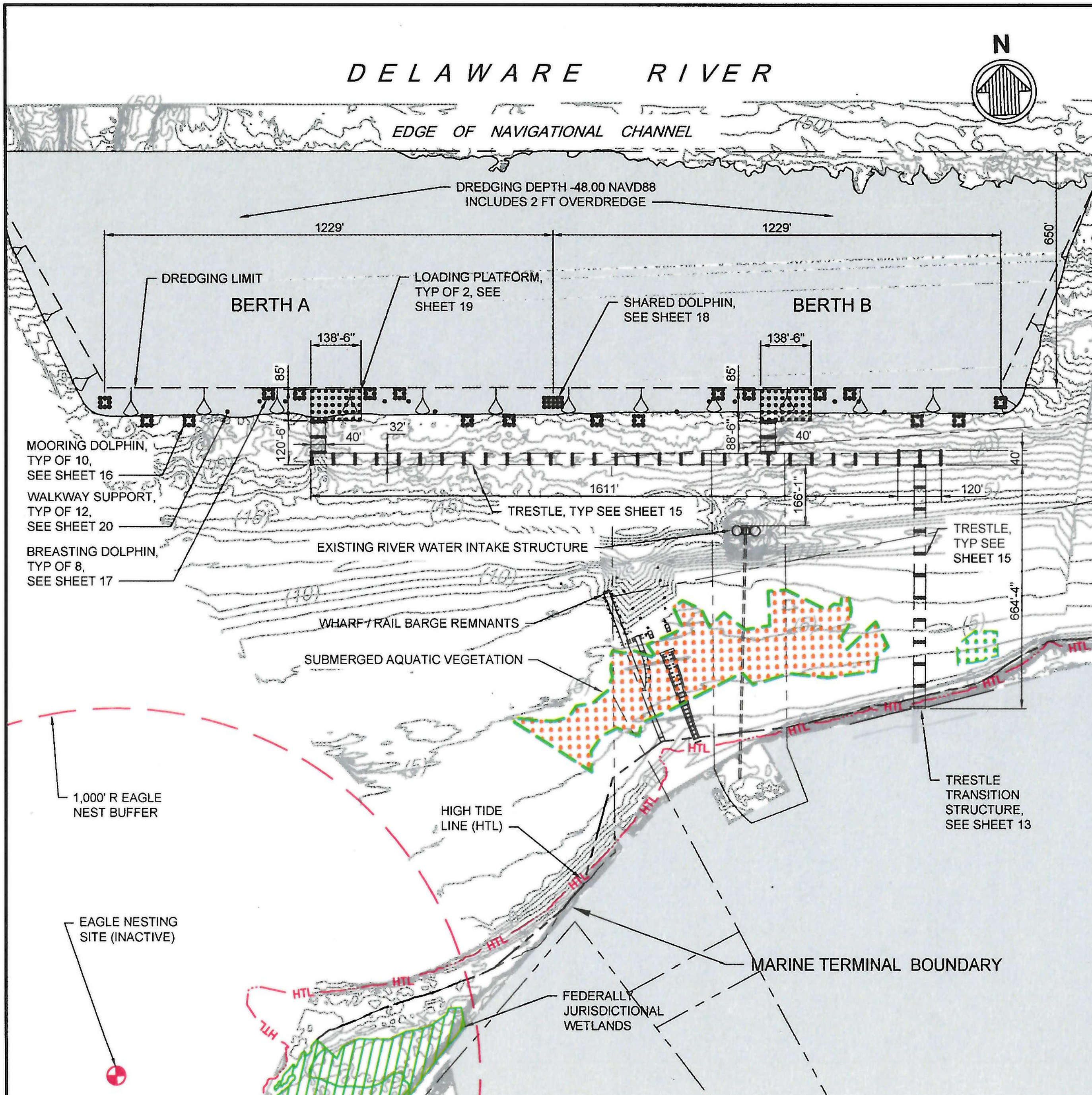

PLAN - PILE BERTH A AND BERTH B

SUBMERGED AQUATIC VEGETATION MITIGATION AREA.

SUBMERGED AQUATIC VEGETATION BED, SURVEYED BY MATRIX NEW WORLD ON 09/28/18.

AID TO NAVIGATION (USCG) OBTAINED FROM NOAA CHART 12312 LAST CORRECTION DATE 2018-07-02.

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	200' 0' 200' 400' SCALE: 1"=400' DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 10 OF 20

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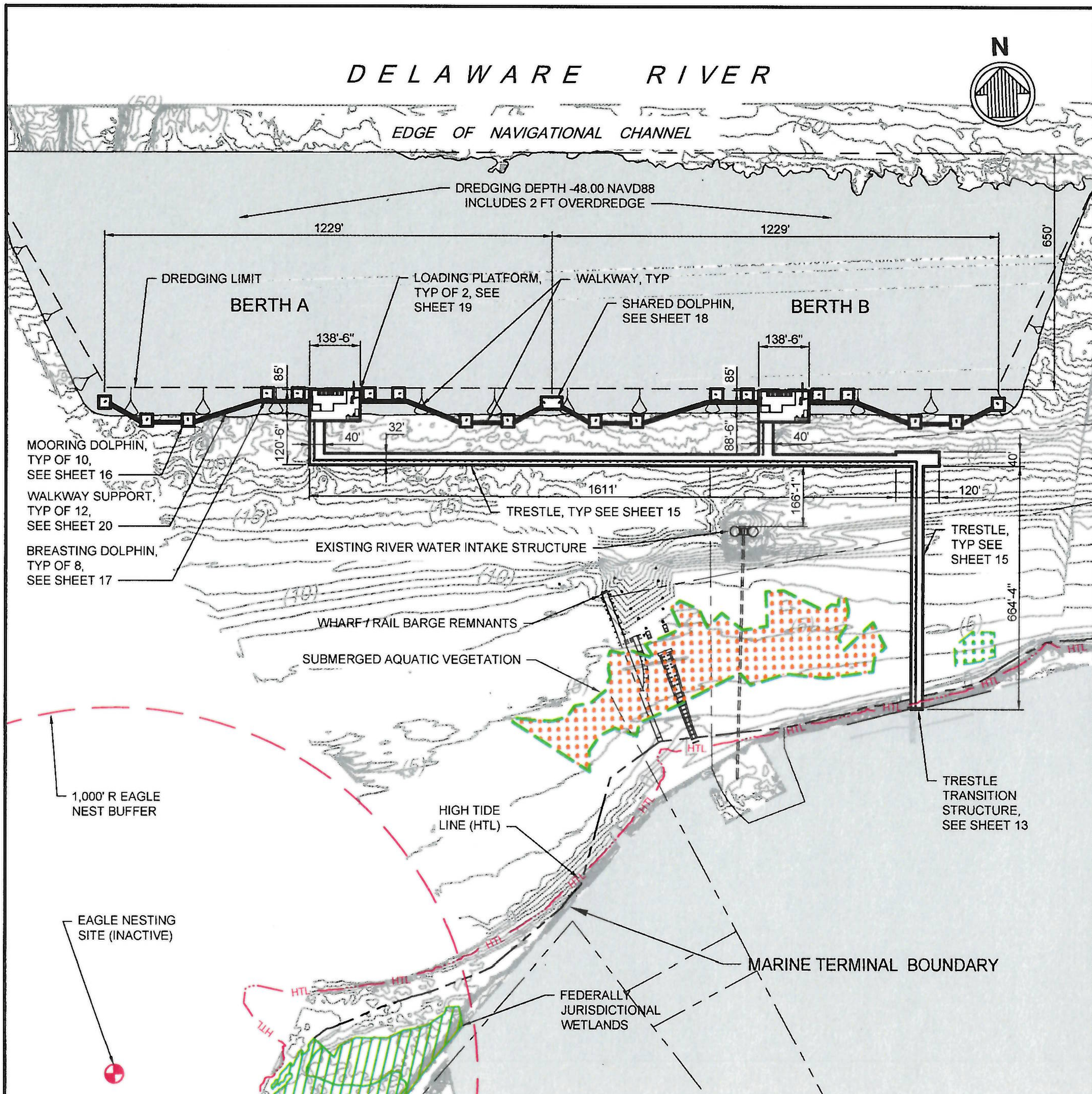
E-10



PLAN - DECK BERTH A AND BERTH B

SUBMERGED AQUATIC VEGETATION MITIGATION AREA.

SUBMERGED AQUATIC VEGETATION BED, SURVEYED BY MATRIX NEW WORLD ON 09/28/18.

AID TO NAVIGATION (USCG) OBTAINED FROM NOAA CHART 12312 LAST CORRECTION DATE 2018-07-02.

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

200' 0' 200' 400'
SCALE: 1"=400'

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

SHEET 11 OF 20

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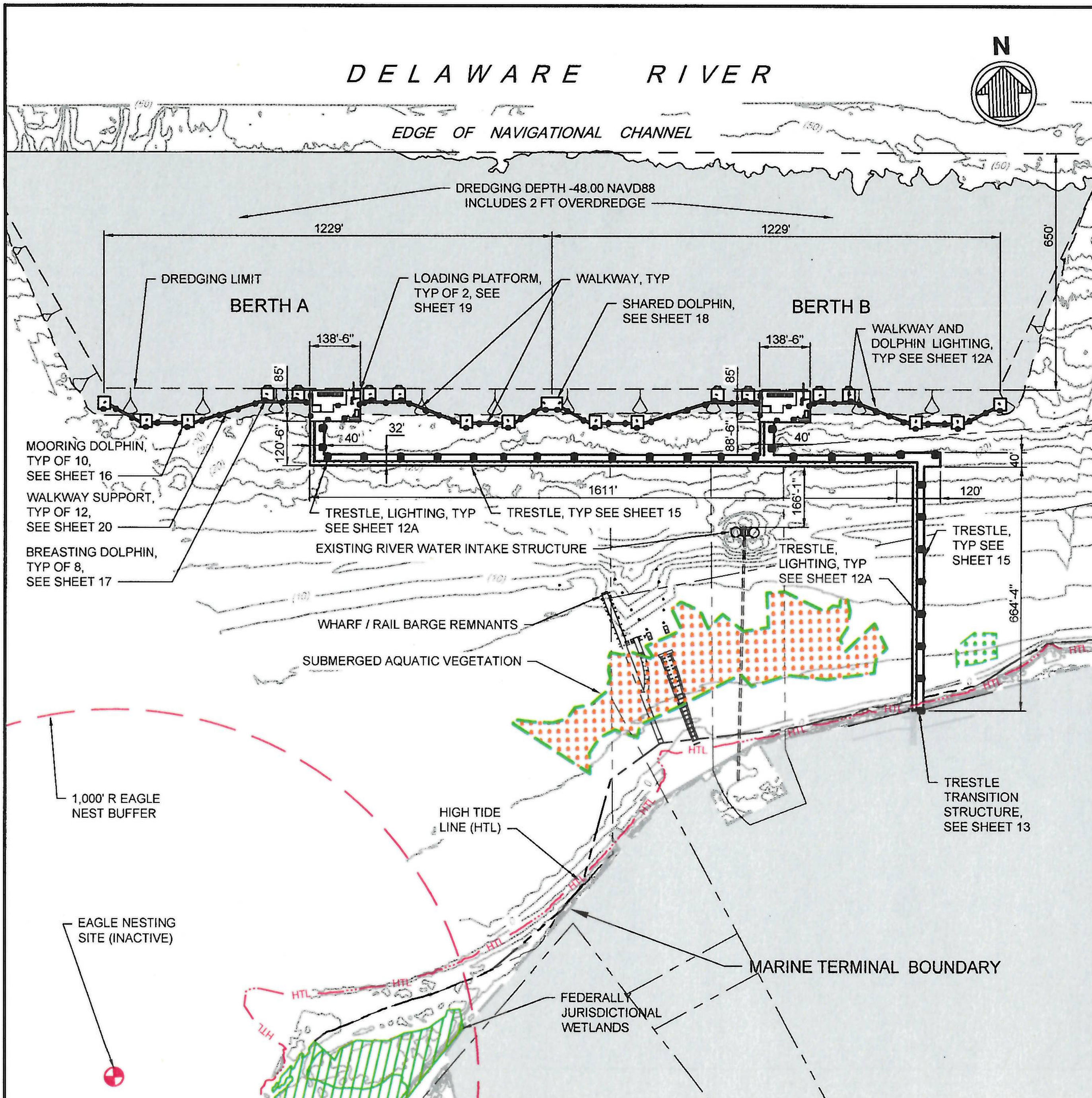
E-11



PLAN - LIGHTING GENERAL ARRANGEMENT BERTH A AND BERTH B

SUBMERGED AQUATIC VEGETATION MITIGATION AREA.

SUBMERGED AQUATIC VEGETATION BED, SURVEYED BY MATRIX NEW WORLD ON 09/28/18.

AID TO NAVIGATION (USCG) OBTAINED FROM NOAA CHART 12312 LAST CORRECTION DATE 2018-07-02.

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	200' 0' 200' 400' SCALE: 1"=400' DATE: MARCH 20, 2019 REISSUE: AUGUST 16, 2019 SHEET11A OF 20

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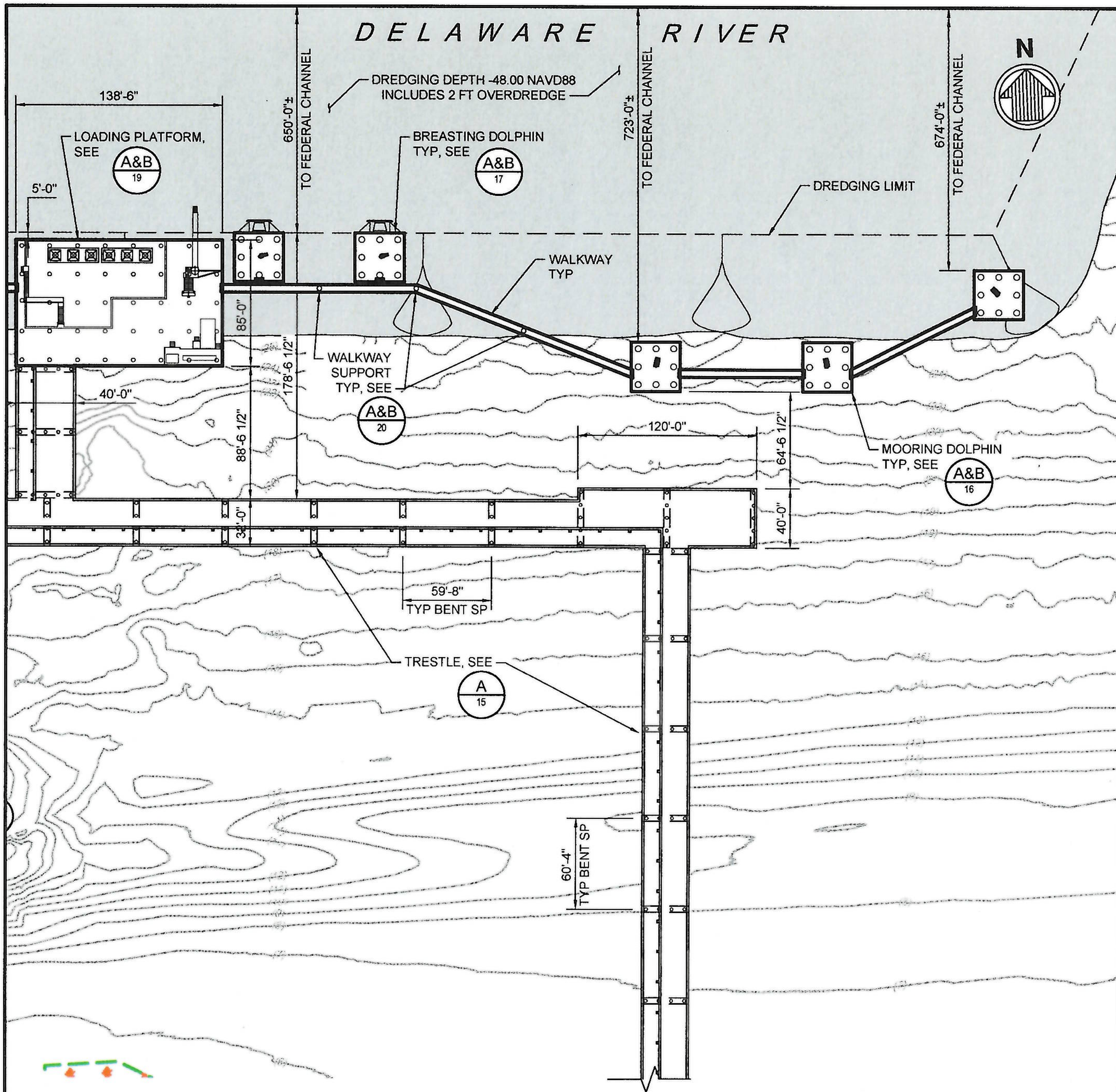

PLAN - ENLARGED
BERTH A AND BERTH B

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

100' 0' 100' 200'
SCALE: 1"=100'

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

SHEET 12 OF 20

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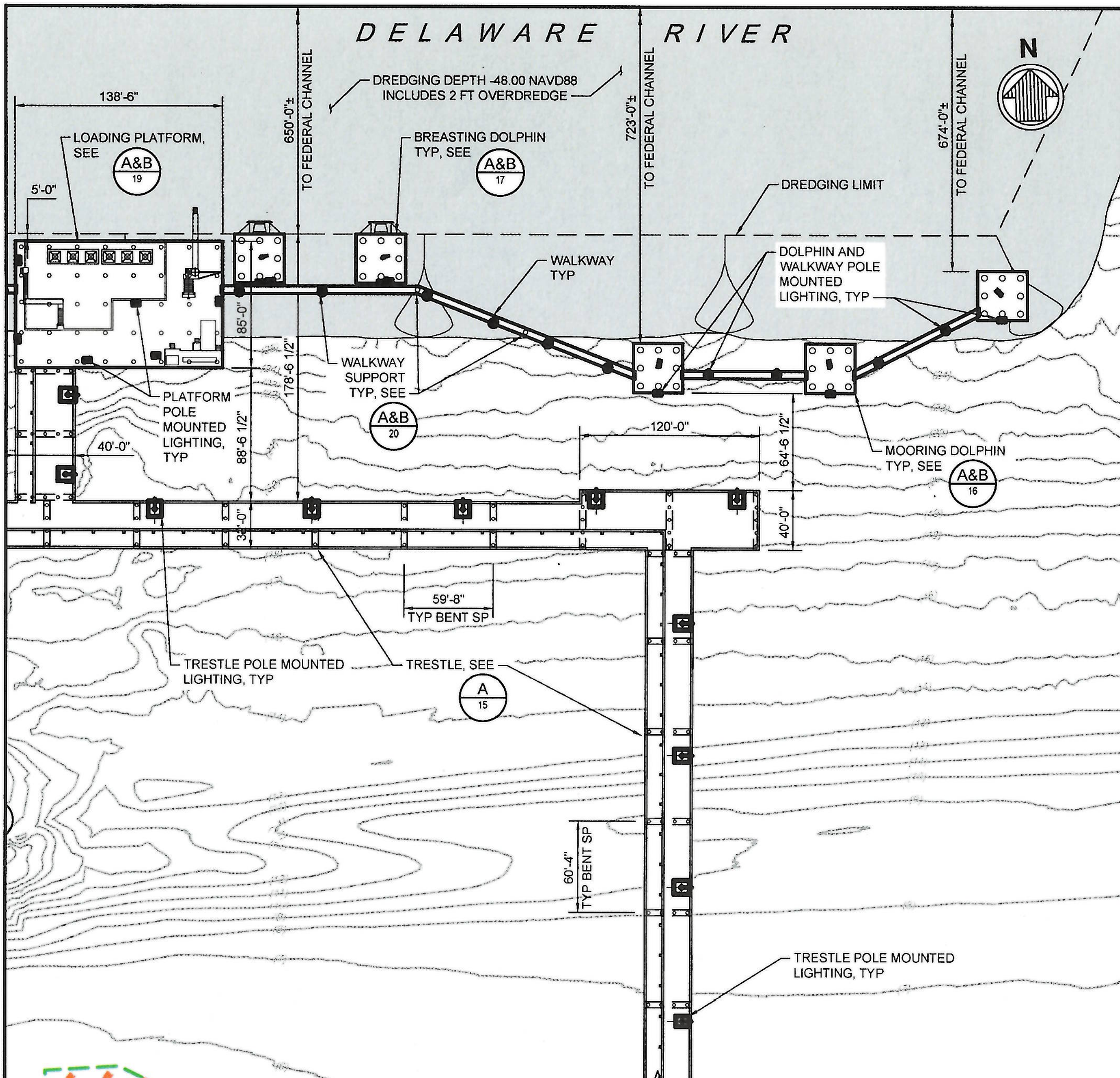

LUMINAIRE SCHEDULE

SYMBOL	QTY	LABEL	ARRANGEMENT
	34	LED FLOOD LIGHT ON POLE, CLASS 1 DIV 2	SINGLE
	27	LED ROADWAY ON POLE	SINGLE
	3	LED ROADWAY ON POLE	SINGLE
	40	LED PENDANT ON STANCHION, CLASS 1 DIV 2	SINGLE

PLAN - ENLARGED LIGHTING
BERTH A AND BERTH B

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

100' 0' 100' 200'
SCALE: 1"=100'

DATE: MARCH 20, 2019
REISSUE: AUGUST 16, 2019

SHEET 12A OF 20

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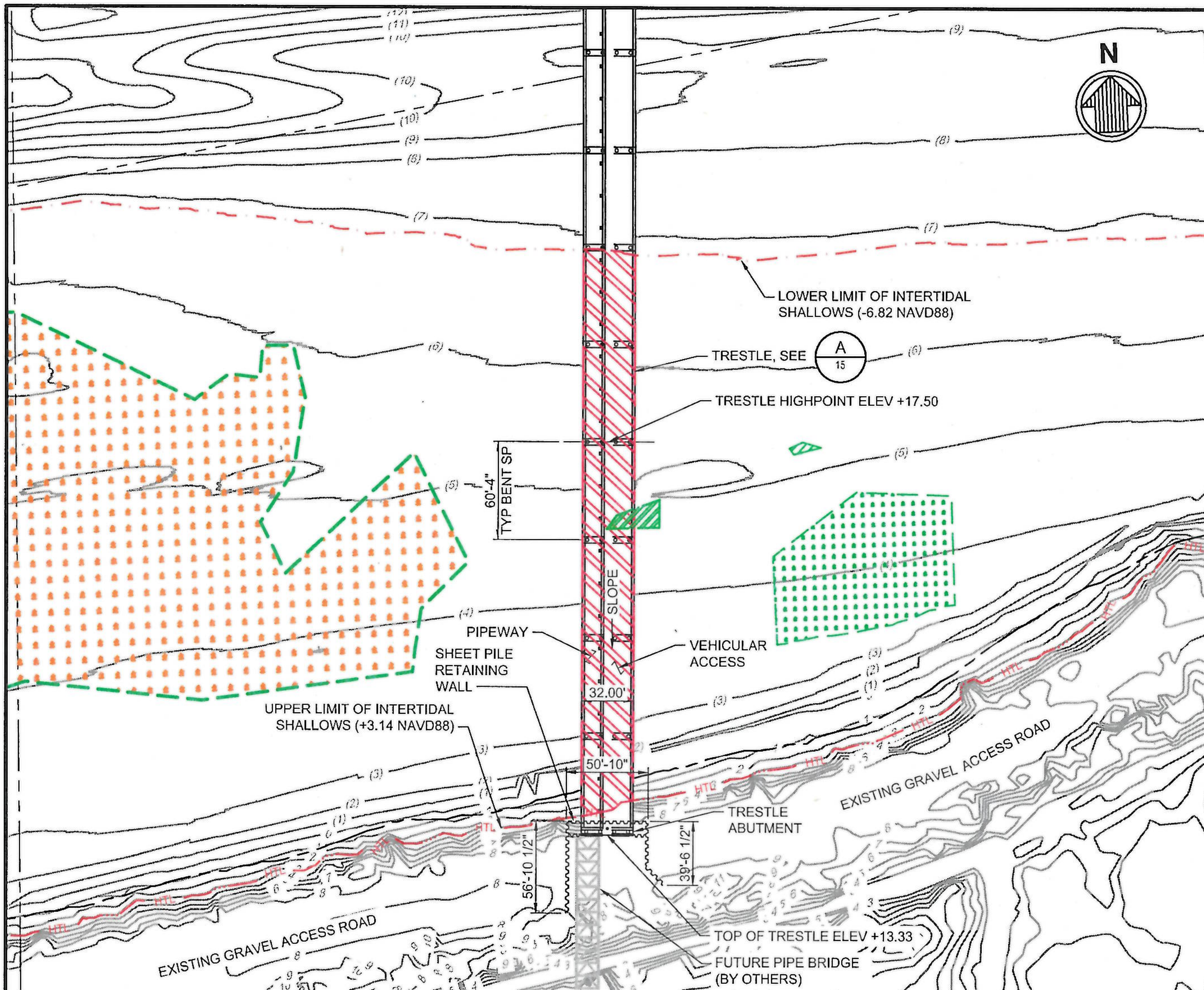
E-14



PLAN - LANDSIDE TRANSITION
BERTH A AND BERTH B

LEGEND

- AREA OF TRESTLE IN INTERTIDAL/SUBTIDAL SHALLOWS (0.25 AC)
- SUBMERGED AQUATIC VEGETATION MITIGATION AREA.
- SUBMERGED AQUATIC VEGETATION BED, SURVEYED BY MATRIX NEW WORLD ON 09/28/18.
- REMAINING SUBMERGED AQUATIC VEGETATION BED AFTER TRANSPLANTING BY MATRIX NEW WORLD ON 08/06/19.
- SUBMERGED AQUATIC VEGETATION TRANSPLANT AREA 08/06/19.

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	50' 0' 50' 100' SCALE: 1"=50' DATE: FEBRUARY 22, 2019 REISSUE: DECEMBER 02, 2019 SHEET 13 OF 20

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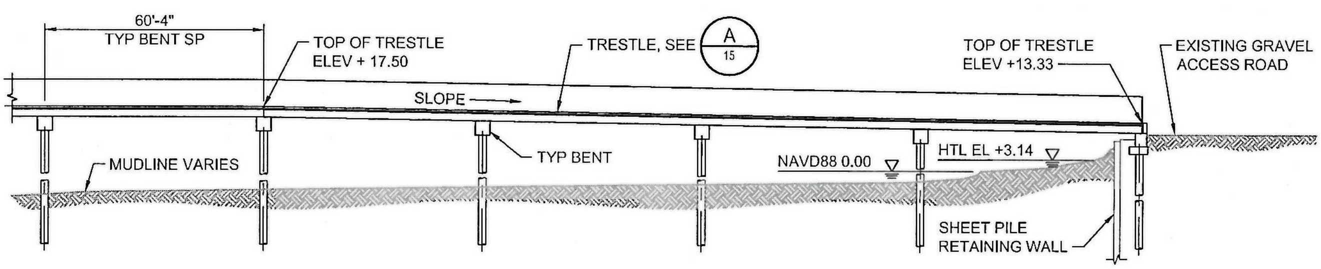
E-15



SECTION - LANDSIDE TRANSITION BERTH A AND BERTH B

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

50' 0' 50' 100'
SCALE: 1"=50'

DATE: FEBRUARY 22, 2019
REISSUE: DECEMBER 02, 2019

SHEET 14 OF 20

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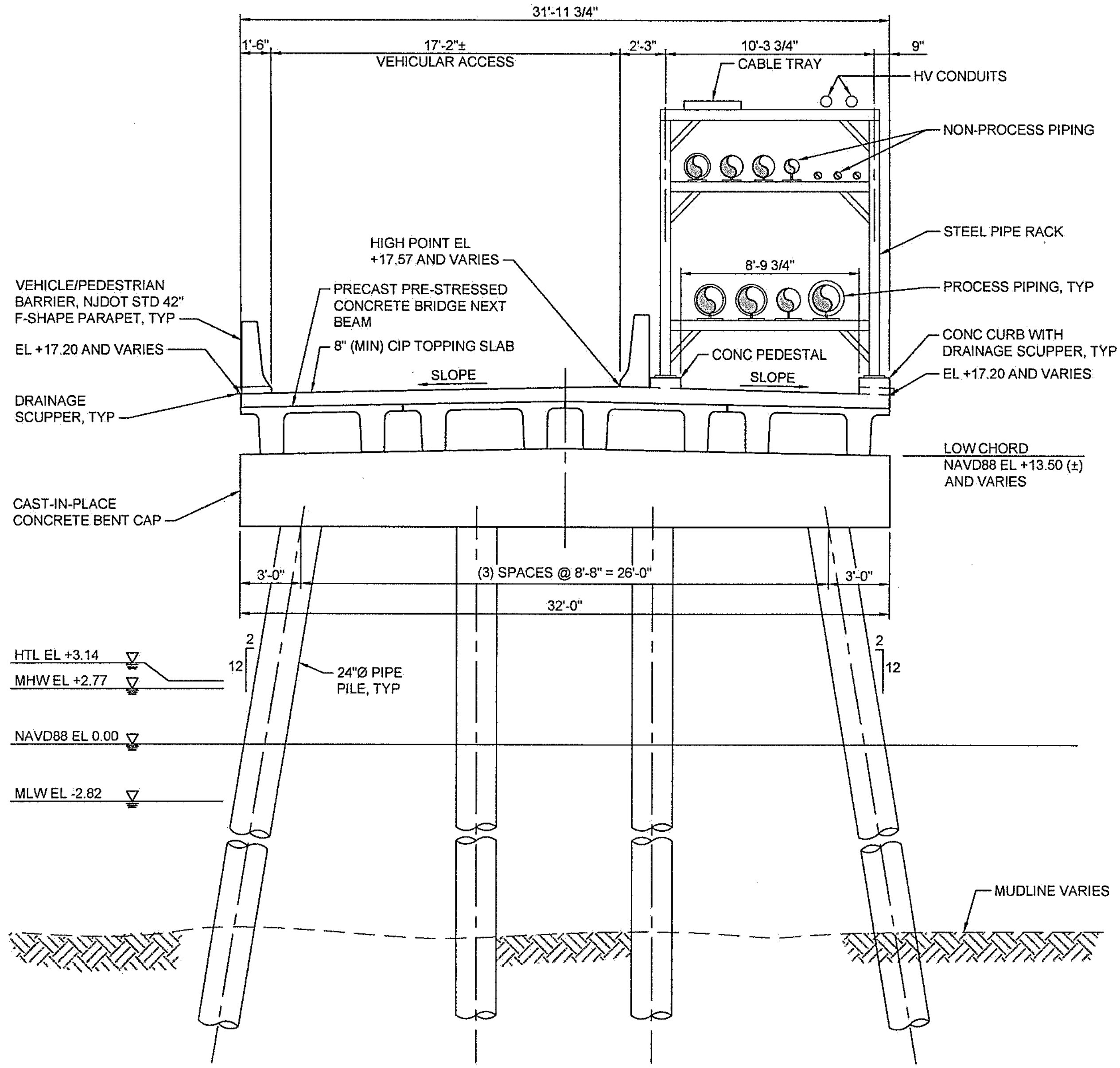
E-16



NOTE:

PILE BENTS SHALL BE SPACED 60'-0"±.

SECTION - TYPICAL TRESTLE

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 15 OF 20

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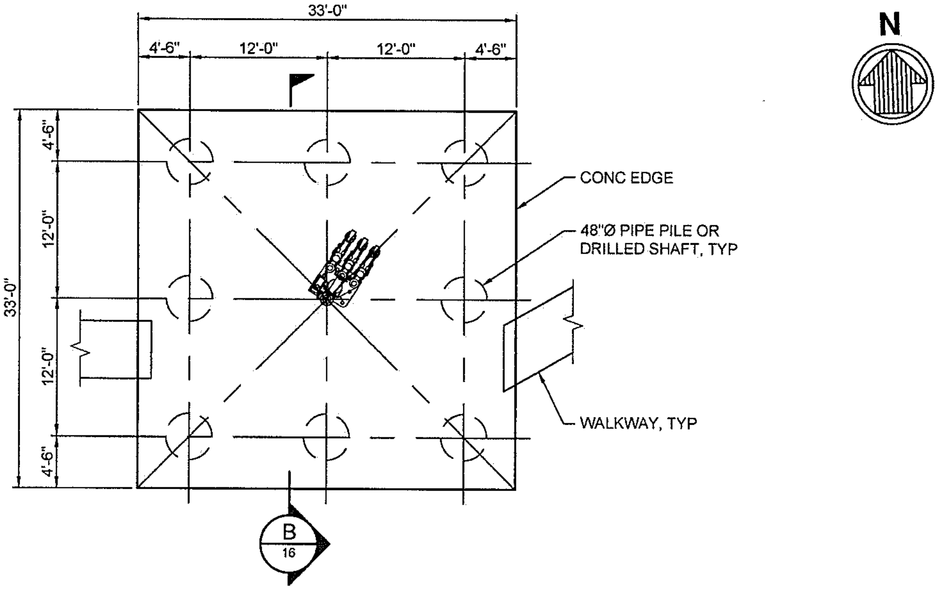
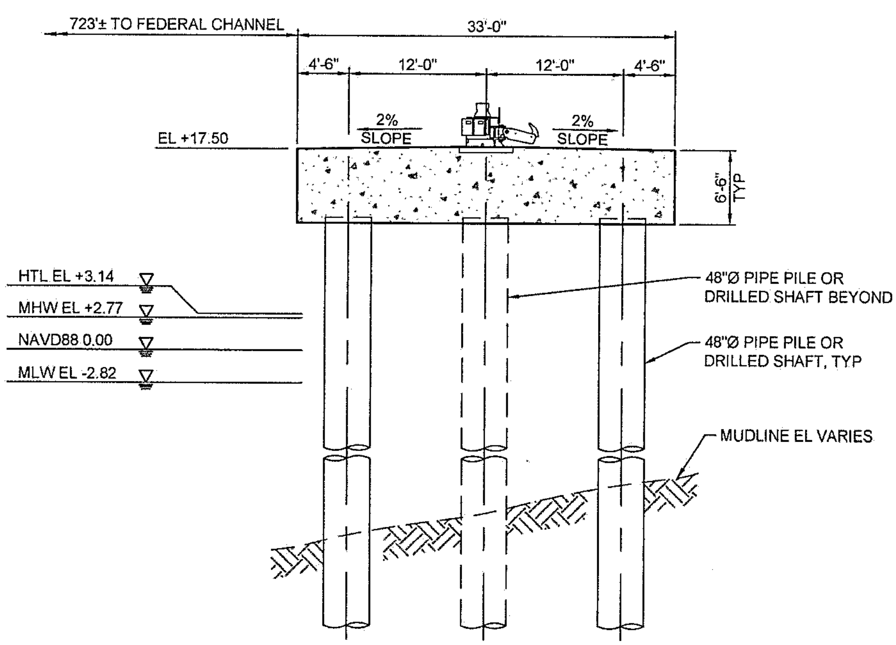
E-17



A 16 TOP PLAN - TYPICAL MOORING DOLPHIN
SCALE: 1/16"=1'-0"



B 16 SECTION - TYPICAL MOORING DOLPHIN
SCALE: 1/16"=1'-0"

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 16 OF 20

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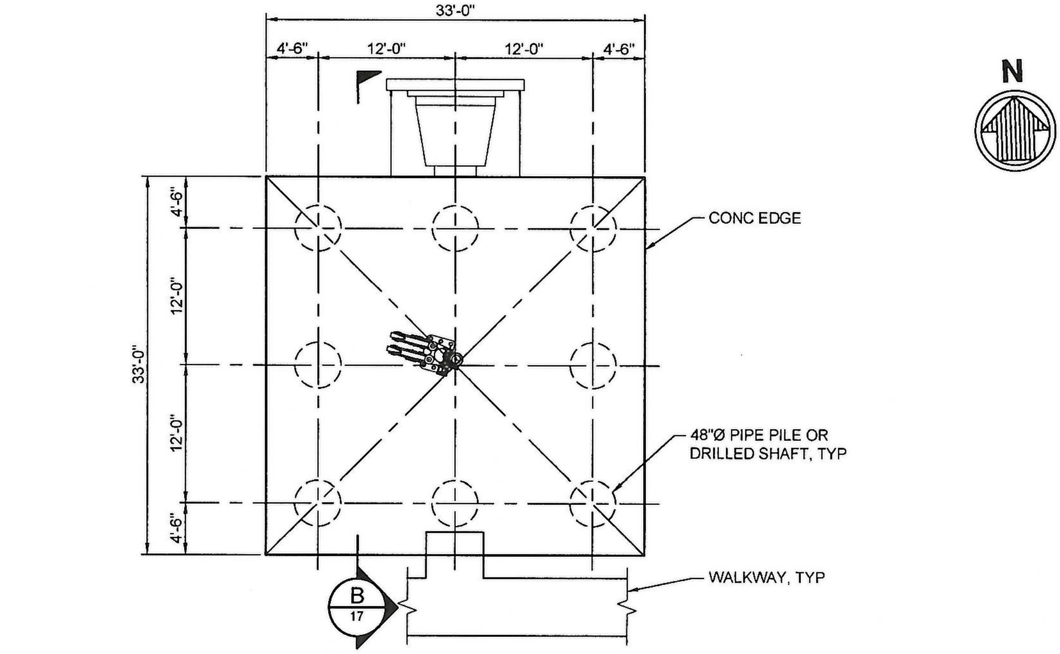
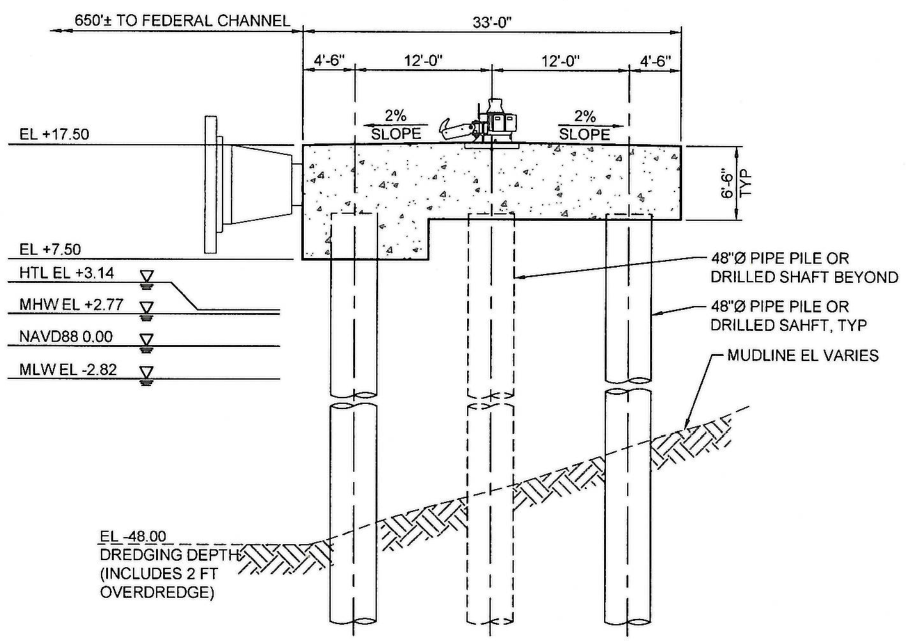


A 17 TOP PLAN - TYPICAL BREASTING DOLPHIN
SCALE: 1/16"=1'-0"



B 17 SECTION - TYPICAL BREASTING DOLPHIN
SCALE: 1/16"=1'-0"

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 17 OF 20

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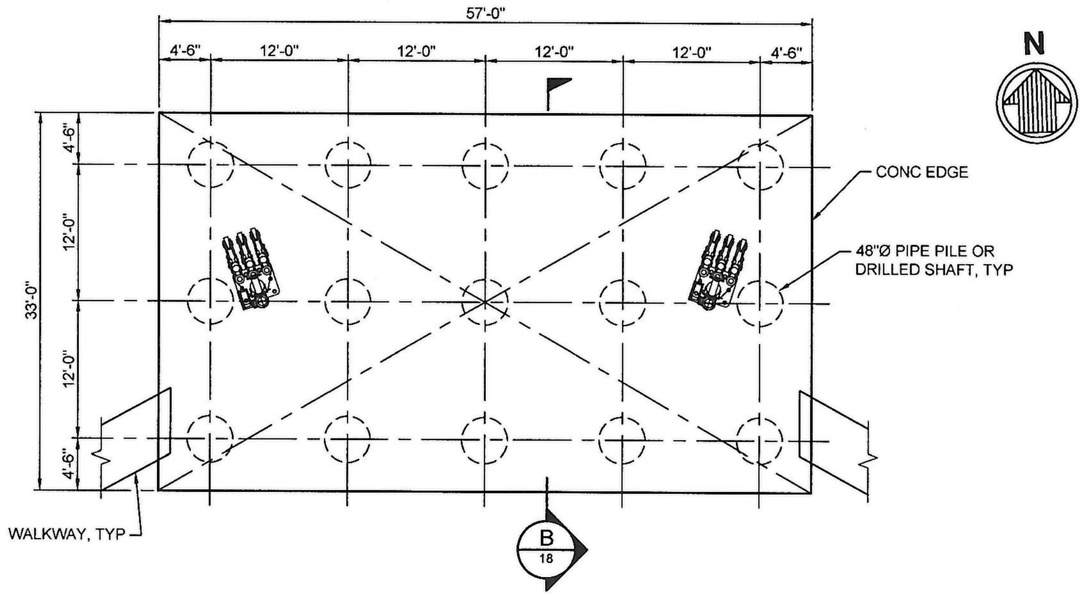
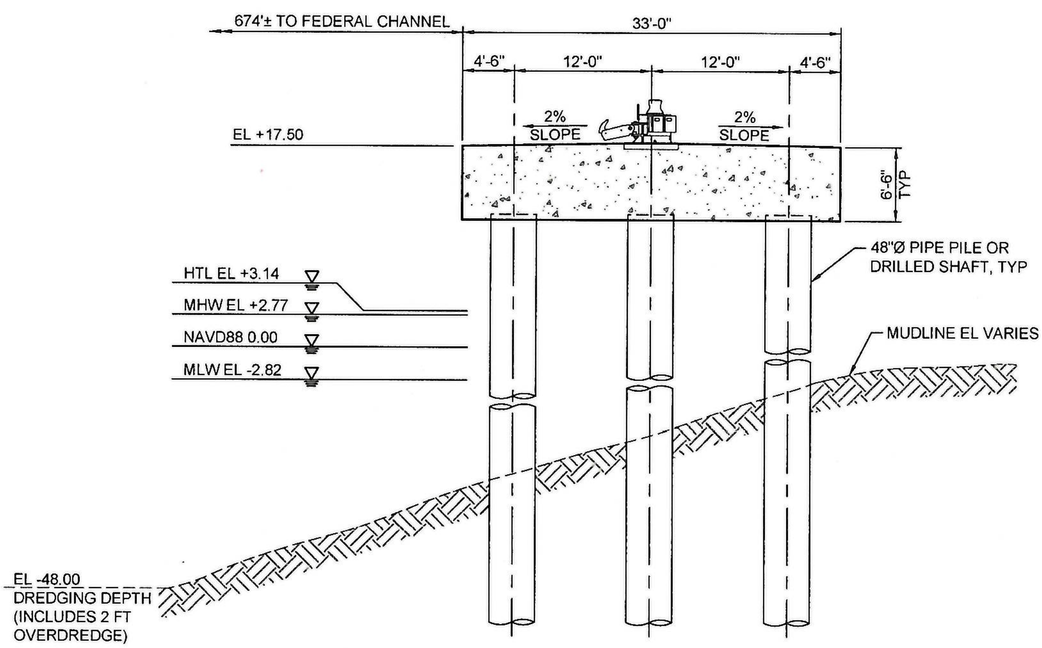
E-19



A 18 TOP PLAN - SHARED DOLPHIN
SCALE: 1/16"=1'-0"



B 18 SECTION - SHARED DOLPHIN
SCALE: 1/16"=1'-0"

APPLICATION BY: DELAWARE RIVER PARTNERS LLC 200 N REPAUNO AVENUE GIBBSTOWN, NEW JERSEY 08027 ENGINEER: moffatt & nichol	DRP GIBBSTOWN LOGISTICS CENTER DOCK 2 PROJECT LOCATION: DELAWARE RIVER GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY	DATE: FEBRUARY 22, 2019 REISSUE: AUGUST 16, 2019 SHEET 18 OF 20

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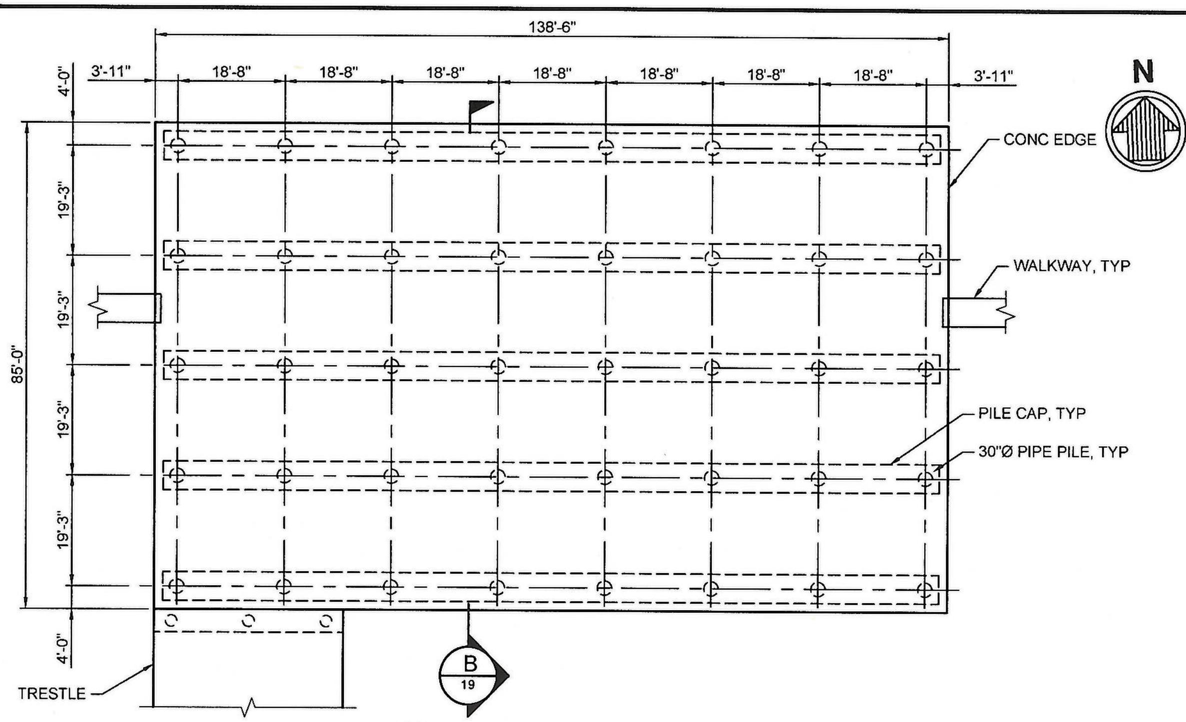
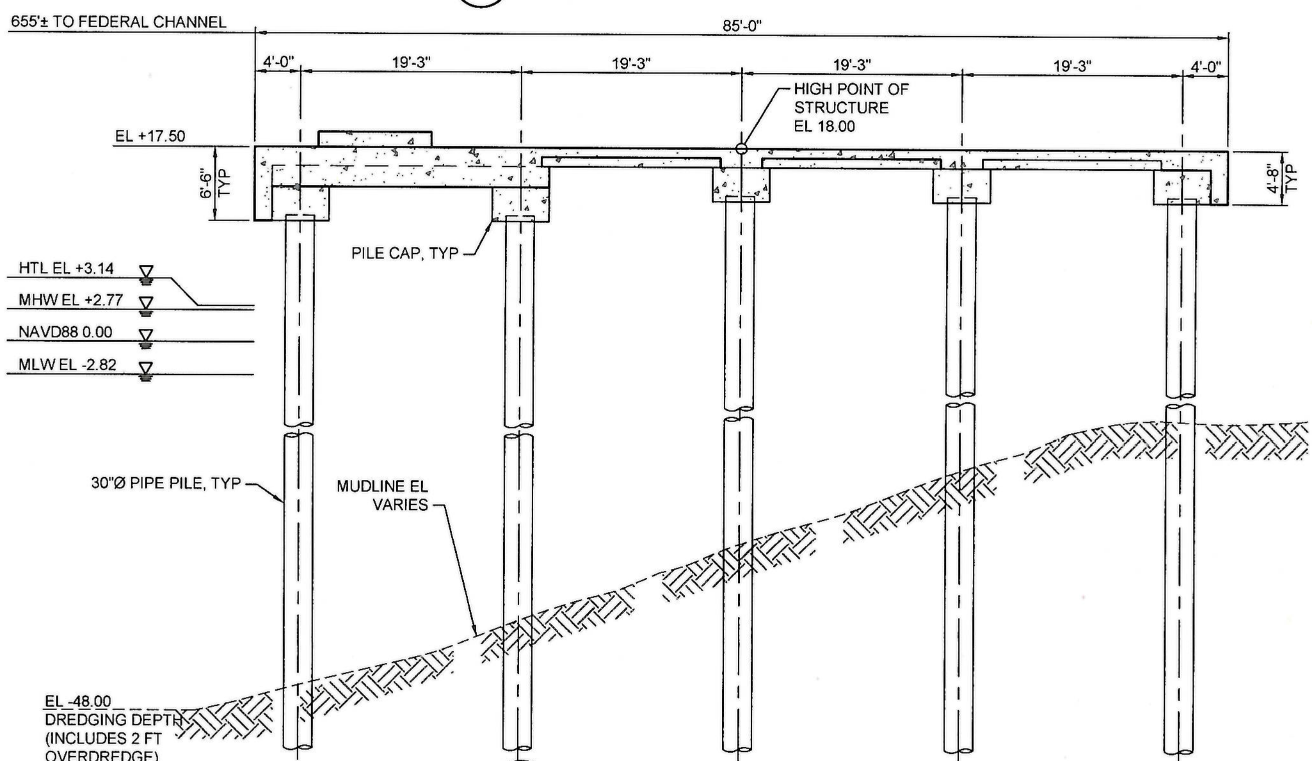
E-20



A 19 TOP PLAN - LOADING PLATFORM
SCALE: 1/32"=1'-0"



B 19 SECTION - LOADING PLATFORM
SCALE: 1/16"=1'-0"

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

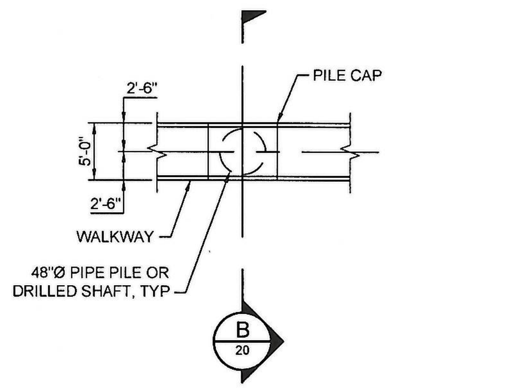
PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

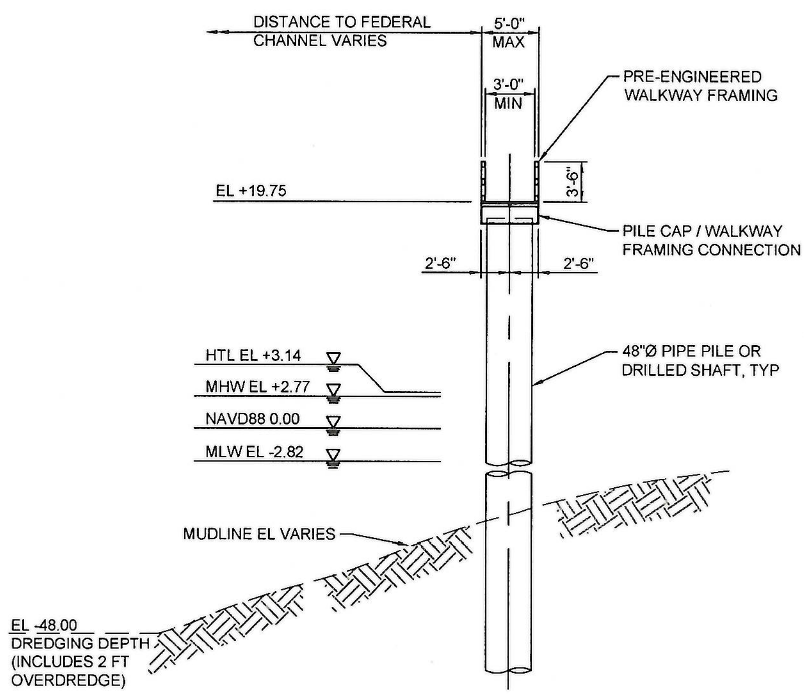
SHEET 19 OF 20

File: Q:\BA\10377 DRP Energy FD\500 CADD_ACTIVE_Permits_USACE Dock2_SheetSet\103770P-019 ; Plotted: 8/15/2019 5:02 PM by VOELKER, PAUL ; Saved: 8/15/2019 4:54 PM by PVOELKER

E-21



A
20
TOP PLAN - TYPICAL WALKWAY SUPPORT
SCALE: 1/16"=1'-0"



B
20
SECTION - TYPICAL WALKWAY SUPPORT
SCALE: 1/16"=1'-0"

APPLICATION BY:
DELAWARE RIVER PARTNERS LLC
200 N REPAUNO AVENUE
GIBBSTOWN, NEW JERSEY 08027

ENGINEER:
moffatt & nichol

DRP GIBBSTOWN
LOGISTICS CENTER
DOCK 2

PROJECT LOCATION:
DELAWARE RIVER
GIBBSTOWN, GREENWICH TOWNSHIP, NEW JERSEY

DATE: FEBRUARY 22, 2019
REISSUE: AUGUST 16, 2019

SHEET 20 OF 20

File: Q:\BA\10377 DRP Energy FD\500 CADD_ACTIVE_Permits_USACE Dock2_SheetSet\103770P-020 ; Plotted: 8/15/2019 5:02 PM by VOELKER, PAUL ; Saved: 8/15/2019 4:29 PM by PVOELKER

E-22

NOTIFICATION/CERTIFICATION OF WORK COMMENCEMENT FORM

Permit Number: CENAP-OP-R-2016-0181-39
State Permit #: 0807-06-0002.1, CZM 160004
Name of Permittee: Delaware River Partners, LLC
Project Name: Delaware River Partners DRP Gibbstown Logistics Center
Waterway: Delaware River
County: Gloucester State: New Jersey
Compensation/Mitigation Work Required: Yes ☐ No ☒

TO: U.S. Army Corps of Engineers, Philadelphia District
Wanamaker Building - 100 Penn Square East
Philadelphia, Pennsylvania 19107-3390
Attention: CENAP-OP-R

I have received authorization to: construct a dock to handle bulk liquid products at a site located at Block 8, Lots 4 and 4.02, Greenwich Township, Gloucester County, New Jersey.

The work will be performed by:

Name of Person or Firm ______________________________

Address: ______________________________

____

I hereby certify that I have reviewed the approved plans, have read the terms and conditions of the above referenced permit, and shall perform the authorized work in strict accordance with the permit document. The authorized work will begin on or about __________ and should be completed on or about __________.

Please note that the permitted activity is subject to compliance inspections by the Army Corps of Engineers. If you fail to return this notification form or fail to comply with the terms or conditions of the permit, you are subject to permit suspension, modification, revocation, and/or penalties.

______________________________ ______________
Permittee (Signature and Date) Telephone Number

______________________________ ______________
Contractor (Signature and Date) Telephone Number

NOTE: This form shall be completed/signed and returned to the Philadelphia District Office a minimum of 10 days prior to commencing work.

NOTIFICATION/CERTIFICATION OF WORK COMPLETION/COMPLIANCE FORM

Permit Number:	CENAP-OP-R-2016-0181-39
State Permit #:	0807-06-0002.1, CZM 160004
Name of Permittee:	Delaware River Partners, LLC
Name of Contractor:	____________________
Project Name:	Delaware River Partners DRP Gibbstown Logistics Center
County:	Gloucester State: New Jersey
Waterway:	Delaware River

Within 10 days of completion of the activity authorized by this permit, please sign this certification and return it to the following address:

U.S. Army Corps of Engineers, Philadelphia District
Wanamaker Building - 100 Penn Square East
Philadelphia, Pennsylvania 19107-3390
Attention: CENAP-OP-R

Please note that the permitted activity is subject to a compliance inspection by an Army Corps of Engineers representative. If you fail to return this notification form or fail to perform work in compliance with the permit, you are subject to administrative, civil and/or criminal penalties. Further, the subject permit may be suspended or revoked.

The authorized work was commenced on ____________________.

The authorized work was completed on ____________________.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the above noted permit.

____________________	____________________
Signature of Contractor	Signature of Permittee
Address: ____________________	Address: ____________________
____________________	____________________
Telephone Number: ____________	Telephone Number: ____________

For project located in areas identified as shellfish habitat, you must include with this form a bill of lading; sales order or any other document(s) demonstrating non-polluting materials were purchased and utilized for your project. I hereby certify that I and/or my contractor have utilized non-polluting materials as defined in the above noted permit.

____________________	____________________
Signature of Contractor	Signature of Permittee

Exhibit H

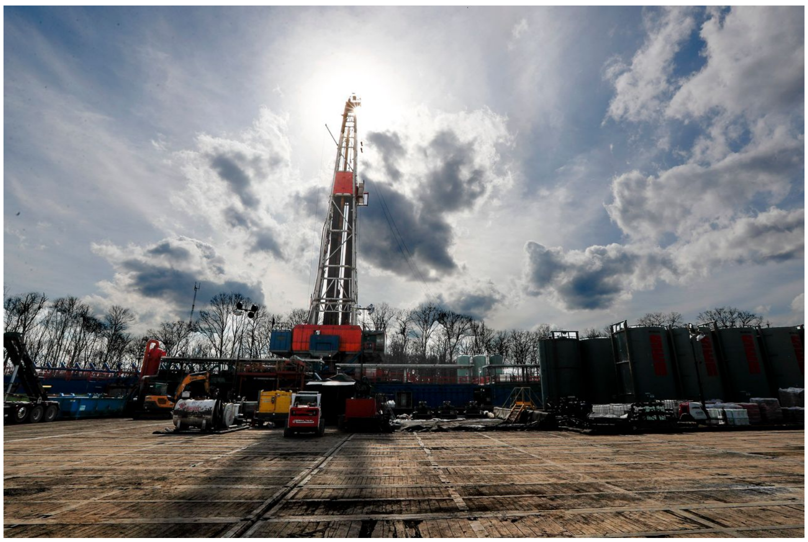
https://www.wsj.com/articles/biden-would-be-right-to-ban-lng-terminal-11611261741

OPINION | LETTERS

Biden Would Be Right to Ban LNG Terminal

Blocking this project from moving forward should, indeed, be an easy call.

Jan. 21, 2021 3:42 pm ET



A shale gas drilling site in St. Mary's, Pa.

PHOTO: KEITH SRAKOCIC/ASSOCIATED PRESS

Regarding your editorial "Biden's First Fracking Test" (Jan. 11): The proposed New Jersey liquefied natural gas (LNG) port should be an easy call, but not for the reasons you suggest.

This massive facility would be the first LNG project in the majestic Delaware River Basin—which provides drinking water for more than 15 million people. Make no mistake, every aspect of this project poses significant risks to our environment and our communities.

For starters, LNG is especially harmful to the climate. In every step of its life cycle, LNG emits methane—a powerful greenhouse gas that is 84 times more potent than carbon dioxide. LNG is also potentially explosive. Even the tiniest leak can ignite fires and explosions. The project would move LNG over hundreds of miles through heavily populated areas in Pennsylvania and New Jersey, ripping through black, brown and low-income communities and putting thousands at risk of deadly accidents.

The Gibbstown site also appears to violate rules governing toxic PCB water pollution. PCBs, one of only a handful of chemicals ever banned in the U.S., are especially dangerous to pregnant women and unborn children. Pollution from PCBs has turned the nearby Hudson River into one the largest Superfund sites in the nation and decimated the Hudson's once-thriving commercial fishery.

Astonishingly, the U.S. Army Corps of Engineers has failed to even conduct a full study of the project's environmental impacts, as required by bedrock federal environmental law.

With so much at stake, blocking this project from moving forward should, indeed, be an easy call.

Mark A. Izeman

Natural Resources Defense Council

New York

Appeared in the January 22, 2021, print edition.

Exhibit I

The Washington Post *Democracy Dies in Darkness*

Proposal to build LNG terminal on Delaware River could pose early test for the Biden administration

Environmentalists oppose the controversial project, but labor unions endorse it

By Will Englund

January 5, 2021

Environmental organizations have so far been unable to stop a proposed liquefied natural gas export terminal on the Delaware River but are hoping to find allies in the incoming Biden administration.

The terminal, in the New Jersey community of Gibbstown, would receive liquefied natural gas from the fracking fields of northeastern Pennsylvania by train or truck and dispatch it to the Caribbean by ship.

Opponents cite what they say would be the risk of environmental damage from the construction and from the operation of the terminal. They also question the safety of transporting 3 million to 4 million gallons of LNG a day through the Philadelphia metropolitan area — to a site that for a century was a DuPont dynamite factory.

The project could be an early test of the Biden administration's commitment to stronger environmental measures and efforts to combat climate change. It has the backing of local elected officials, business leaders in southern New Jersey and, perhaps most significantly, labor unions that argue it will bring jobs to a distressed area.

New Fortress Energy is seeking to build the terminal, on the Repauno plant site opposite Tinicum Island and Chester, Pa. New Fortress is led by Wes Edens, who is a co-owner of the National Basketball Association's Milwaukee Bucks and argues that natural gas is a bridge fuel to more-sustainable energy sources in the future.

The company did not respond to requests for comment.

The Delaware Riverkeeper Network, a nonprofit advocacy group, has led opposition to the project, and its members are hoping President-elect Joe Biden's concerns for his home state of Delaware — downriver from Gibbstown — will tip the balance.

"He was always protective of Delaware's coastal resources," Tracy Carluccio, deputy director of Delaware Riverkeeper Network, said of Biden. "They're at the bottom of the Delaware River watershed, and they get all the bad stuff that everyone's dumping upstream."

Even before the coronavirus pandemic struck, natural-gas prices were severely depressed in the United States as stockpiles grew and many oil producers chose simply to flare the gas they were extracting as a byproduct. President Trump actively promoted export sales of LNG as a way to support the market.

Early last year, the Transportation Department moved to allow railroads to transport LNG for the first time, over the objections of environmentalists, the National Transportation Safety Board, Native American tribes and other groups.

The idea, backed by New Fortress, was to get the LNG to saltwater ports where it could be loaded on ships.

Carluccio said that means if the Gibbstown project goes ahead, oceangoing tankers laden with LNG will be sailing past low-income neighborhoods in Chester, followed by the port of Wilmington, various coastal refuges on the Delaware and New Jersey riverbanks, and Delaware's beaches.

"They get all the danger and none of the benefits," she said.

LNG has been transported by sea for about 60 years, with few safety issues, but under certain conditions a cloud of escaped gas could ignite, with potentially devastating consequences. A failure of the thermal systems that keep stored LNG at minus-260 degrees Fahrenheit could also lead to what is called a “boiling liquid expanding vapor explosion,” or BLEVE.

The Gibbstown project has received a green light from the Coast Guard, the Army Corps of Engineers, the New Jersey Department of Environmental Protection and — on an administrative appeal last month — the Delaware River Basin Commission.

But the Army Corps and New Jersey environmental rulings have been challenged in court, and Carluccio said her organization plans to take the Delaware River Basin Commission to court before a February deadline. Another possible battleground will be the Federal Energy Regulatory Commission: New Fortress has asked for a ruling saying that the commission lacks jurisdiction over the project, which environmentalists will argue against.

The Natural Resources Defense Council contends that the project violates clean-water laws and regulations. Actor Mark Ruffalo co-wrote an op-ed in the New York Daily News attacking the project. “Every part of the way LNG is extracted, transported and stored is dirty and dangerous,” it said.

The New Jersey Sierra Club argues that the project would damage wetlands that support the Atlantic sturgeon and other endangered species and would spur even more hydraulic fracturing, or fracking, in nearby Pennsylvania.

But some unions have strongly supported the project.

“Since 1902, the International Brotherhood of Electrical Workers has contributed to the industrial growth in communities across southern New Jersey and along the Delaware River,” Daniel Cosner, business manager for IBEW Local 351, wrote in a letter to the river commission. “For the past century, the jobs we have completed have helped build the middle class and ensured the economy works for everyone. This project does just that.”

The terminal “will bring new life to this once-blighted facility while creating hundreds of good paying, union construction-related jobs and providing much needed tax revenue to the community,” he wrote.

Additional support comes from the Iron Workers union, the Pilots’ Association for the Bay and River Delaware, the United Brotherhood of Carpenters and several business associations.

An engineer working for New Fortress, Kevin Webb, told the Greenwich Township, N.J., zoning board that the company expects to operate the dock 24 hours a day, with 50 to 70 permanent employees.

New Fortress has already built one dock at Gibbstown to handle mixed cargoes. The proposed second dock would be devoted to the transfer of LNG or other refinery byproducts from freight cars or trucks to ships.

A wharf, with room for two deepwater ships at a time, would be built out in the river, parallel to the shore, connected to the land by a trestle pier. It would require dredging about 665,000 cubic yards of sediment over a 45-acre area.

The Repauno plant site includes “a diverse and significant amount of hazardous waste” that DuPont dumped into “unlined landfills, sand tar pits, pipes and ditch basins,” according to a suit against the former owner brought by state environmental officials. The land is contaminated by polychlorinated biphenyls, or PCBs, among other wastes.

Opponents of the project argue that the dredging will release PCBs into the river, but the Basin Commission ruled that proper mitigation procedures should be sufficient to contain the pollutant. Representatives from member states New Jersey, Delaware and Pennsylvania voted in favor of the plan; the commissioner from New York, which has dealt with severe PCB pollution in the Hudson River, abstained.

In a letter to the commission, the Natural Resources Defense Council said that “recent scientific evidence has shown that PCBs are far more toxic than scientists or environmental agencies realized even 15 years ago.”

Under the New Fortress plan, the natural gas would be liquefied in Pennsylvania, most likely at a plant in the town of Wyalusing, in Bradford County, about 35 miles northwest of Scranton. The company has suggested that it would run two “unit trains” of up to 100 tank cars every day to the terminal; loading a ship to capacity would take about 10 days.

The LNG would be used to power electric plants in the Caribbean.

Opponents argue that climate change requires a move away from fossil fuels, including natural gas, and that this project would be a step in the wrong direction.

“Fracking is dying. Natural gas is on its way out,” Carluccio said. “We’re totally committed to defeating the export of LNG completely. It’s an outrageous project.”

Exhibit J

Business

Contentious N.J. river terminal to export fracked Pa. natural gas gets final approval

The DRBC approved plans to build an LNG wharf across from Philadelphia International Airport over objections from environmentalists, who said the vote was a "deadly blow" to the river.

The Gibbstown Logistics Center is being built on the former Dupont Repauno Works property in Glouceste ... **Read more**
Handout

by Andrew Maykuth
Published Dec 9, 2020

For the second time in two years, the Delaware River Basin Commission on Wednesday approved a plan to build a 1,300-foot-long pier to load tankers at the gas wells.

The DRBC approved an application by Delaware River Partners LLC to build a second wharf on the property, where it is developing the Gibbstown Logistics Center to receive and export several commodities including fuels, automobiles, and bulk cargo. The DRBC's vote was 4-0, with one abstention.

Most of the objections focused on the owner's plan to use the wharf to export liquefied natural gas (LNG) manufactured in northern Pennsylvania and transported to the site by trucks or trains. Environmentalists campaigned vigorously to stop the project and barraged four state governors with petitions that said the project would worsen climate change and attract 100-car "bomb trains" carrying dangerous LNG across Philadelphia.

"We are scandalized by the approval of this," said Tracy Carluccio, deputy director of the Delaware Riverkeeper Network, which has led the opposition to the plan. She characterized the vote as a "deadly blow" to the Delaware River and vowed to file an appeal in federal court.

"The DRBC has sold out the basin and sided with the fracking industry," said Jeff Tittel,

director of the New Jersey Sierra Club, which was among a coalition of environmental groups that organized the opposition campaign.

The commission, an interstate agency whose job is to manage and protect the Delaware River, said the broader issues of climate change and gas development were beyond the scope of its review, which was based on whether construction of a multiuse seaport complied with the commission's long-term development plan along the river.

Delaware River Partners said it was pleased to get final approval after "extensive" review by multiple federal, state, and local agencies.

company said in a statement.

A hearing examiner and the staff of the DRBC had recommended approving permits to dredge the river and to build a pier for the $450 million private port, which is being built on the site of a former DuPont dynamite factory in Greenwich Township. The DuPont facility shut down more than two decades ago, and local officials and labor unions have supported the port as a major economic redevelopment project. The project would create about 300 construction jobs and 150 permanent jobs.

The project developer cannot begin work on the dock until it first submits dredging plans to New Jersey environmental regulators at least 60 days in advance, according to its permits. Environmental opponents, meanwhile, say they plan to file a legal challenge of the DRBC's approval and will seek an injunction putting a hold on work during litigation.

LNG's Long Route From Facility to Terminal

A planned export terminal on the Delaware River in Gibbstown, Gloucester County, would receive liquefied natural gas (LNG) processed at a proposed facility in Pennsylvania's Marcellus Shale gas region in Wyalusing. The LNG would be transported from Wyalusing to Gibbstown by rail or truck. Environmentalists are concerned about the hazards of moving the potentially explosive gas over hundreds of miles through some heavily populated areas.

Most likely routes from Wyalusing to Gibbstown

255 miles by rail **174 miles by truck**

SOURCE: Frac Tracker Alliance

JOHN DUCHNESKIE / Staff Artist

commission last year voted unanimously to approve the larger second wharf, which will allow larger ships to berth at the site. The second dock also received permits from the

New Jersey Department of Environmental Protection and the U.S. Army Corps of Engineers.

But the Delaware Riverkeeper Network said last year's process did not allow sufficient public input, so the DRBC put its decision on hold and ordered a more thorough review in 2020, including an eight-day hearing in May where 13 expert witnesses appeared.

The hearing officer, John B. Kelly, in July released a 102-page report in which he recommended the commission reaffirm its previous approval for the project. He said restrictions on construction ensured that its impact on water quality and aquatic life "will be localized and transitory."

cargo that moves through a marine terminal," the DRBC staff said in a recommendation last year.

The Natural Resources Defense Council last week filed a last-minute request to the commission to delay a vote, saying the project was not in compliance with agreements to limit the discharge of toxic polychlorinated biphenyls (PCBs) left on the site. The issue of PCB contaminations from construction of the port, and dredging for the new wharf, will likely be the subject of an appeal.

The commission's vote on Wednesday was 4-0, with yes votes from Pennsylvania, New Jersey, Delaware, and the U.S. Army Corps of Engineers, which represents the federal government. Kenneth Kosinski, the New York state representative, abstained after New York's motion to delay the vote failed. Kosinski said that the project's impact on climate change, and its impact on water quality, needed more study.

Politico on Tuesday, sent a mixed message that he opposed an LNG facility, but said "port infrastructure is desperately needed" in New Jersey, especially to support the offshore wind industry. One potential use of the Gibbstown port is to serve as a staging area for offshore wind developers.

Jeffrey L. Hoffman, a New Jersey official who represented Murphy at Wednesday's DRBC meeting, said the state's vote in favor of the project "is a narrow one."

LNG is produced by super-cooling natural gas to minus-260 degrees until it turns into a liquid. It must be stored and transported in insulated tanks to keep it liquid. If the tanks leak, LNG can freeze anything it contacts. Safety experts say a greater threat is that the fuel leaks, pools, and turns into a vapor cloud that remains cold and moves at ground level rather than dissipating into the atmosphere. If it comes into contact with an ignition source, the fuel can explode.

New Fortress Energy, a company affiliated with the developers of the Gibbstown Logistics Center, is behind a plan to manufacture LNG at a proposed facility in Wyalusing, Pa., northwest of Scranton, and ship the flammable liquid by road or by rail to Gibbstown. There, it would be loaded

New Fortress has not disclosed potential routes for the LNG, but transportation experts and environmentalists say the most likely rail route would follow Norfolk Southern rail lines from Wyalusing through Allentown, Reading, and then move along the Schuylkill before traversing North Philadelphia, and then crossing the Delair Bridge into Pennsauken.

In its filings for a rail permit, New Fortress said it would move several 100-car trains of LNG a day to Gibbstown to continuously fill waiting vessels, or up to 700 tractor-trailer trucks a day. The most direct highway route would follow I-476 through Philadelphia's suburbs, and then cross the Commodore Barry Bridge into New Jersey.

Local officials have protested the transport of LNG on public highways and rails, saying it presents an unacceptable danger. LNG now routinely moves in tanker trucks on highways, but federal hazardous-materials regulations allowed shipments by rail only from Wyalusing to Gibbstown.

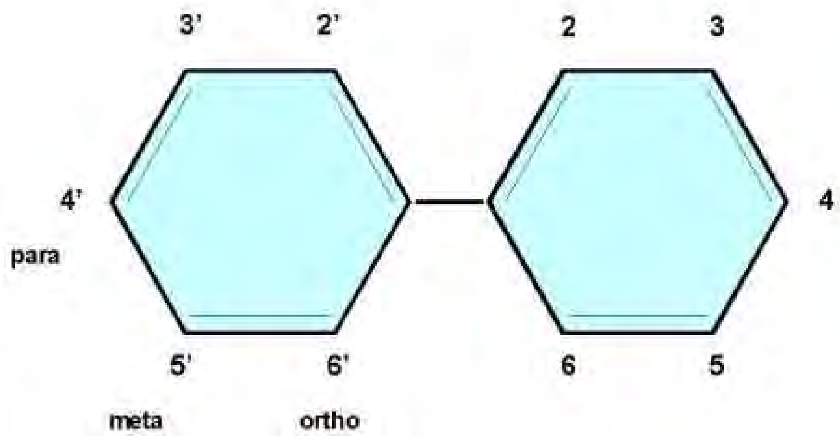
The DRBC's meeting Wednesday was conducted via teleconference because of COVID restrictions, providing spectators with a means to communicate with the commissioners in real time through the chat function. As the proposed resolution was read and then voted on, the public comments in pop-up balloons changed quickly from pleas to vote no, to silent capitalized denunciations of the commission's action.

Published Dec. 9, 2020

Andrew Maykuth
I cover how we produce and use energy, as well as its impact on the economy and the environment.

Exhibit K

PCB TMDL Handbook



Structure of Polychlorinated Biphenyl (PCB) Molecule

U.S. Environmental Protection Agency
Office of Wetlands, Oceans and Watersheds

December 2011
EPA 841-R-11-006

U.S. Environmental Protection Agency
Office of Wetlands, Oceans and Watersheds
Watershed Branch (4503T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Polychlorinated Biphenyl (PCB) Total Maximum Daily Load (TMDL) Handbook
Contents

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

December 20, 2011

MEMORANDUM

SUBJECT: Polychlorinated Biphenyl (PCB) Total Maximum Daily Load (TMDL) Handbook

FROM: Tom Wall, Acting Director /s/
Assessment and Watershed Protection Division

TO: Water Division Directors, Regions 1-10

I am pleased to provide the attached document entitled "PCB TMDL Handbook." The purpose of the attached handbook is to provide Regions, states, and other stakeholders with a compendium of updated information for use in developing total maximum daily loads (TMDLs) for waterbodies impaired by polychlorinated biphenyls (PCBs). This handbook identifies various approaches to developing PCB TMDLs and provides examples of them from around the country, complete with Web references.

PCBs rank sixth among the national causes of water quality impairment in the country. Of the 71,000 waterbody-pollutant combinations listed nationally, over 5,000 (eight percent) are PCB-related. However, of the more than 46,000 TMDLs in place nationally, only about 400 (less than one percent) address PCBs as a pollutant. Our intent is that this handbook will aid in the completion of PCB TMDLs, particularly where these TMDLs will address ongoing and significant sources of PCBs.

The handbook opens with background on what PCBs are and some factors to consider in the early stages of TMDL development (e.g., scale, modeling approaches). Next, the handbook identifies the key elements of a TMDL (e.g., "Identification of Waterbodies, Pollutant Sources, Priority Ranking," "Water Quality Standards and TMDL Target," "Wasteload Allocation") and discusses how those elements can be addressed in PCB TMDLs. The handbook also summarizes and provides Web resources for related tools, including databases for PCB sources, references for analytical methods, and regional air monitoring initiatives.

We thank those who provided assistance in the development of this information and provided comments, including States. If you have further questions, please do not hesitate to contact me at 202-564-4179, or have your staff contact Sarah Furtak at 202-566-1167.

Attachment
cc: Alexandra Dunn, ACWA

I. Overview

A. What is the purpose of this handbook?

In this handbook, we aim to provide stakeholders with a compendium of updated information for using total maximum daily loads (TMDLs) to address waterbodies impaired by polychlorinated biphenyls (PCBs) consistent with Clean Water Act (CWA) section 303(d) and EPA regulations at 40 CFR §130.7(c)(1).

This handbook will identify different approaches that have been successfully used to develop PCB TMDLs and provide examples. In particular, the handbook will address how to develop PCB TMDLs that account for all sources of PCB contamination (including "passive" sources such as landfills in which PCBs are contaminating the soil). One goal of this handbook is to illustrate how development of PCB TMDLs take into account other program considerations (e.g., Water Quality Standards [WQS]), and how TMDLs may benefit from tools available in other programs (e.g., Superfund).

B. Which pollutant are we addressing?

The focus of this handbook is on PCBs, one of the most significant legacy pollutants in terms of number of waterbodies impaired. PCBs rank sixth atop national causes of impairment as tracked in the Assessment, TMDL Tracking, and Implementation System (ATTAINS). PCBs represent about eight percent of all causes of impairment nationally on CWA section 303(d) lists.[1]

C. What are PCBs[2]?

PCBs are a family of chlorinated organic compounds formed by two benzene rings linked by a single carbon-carbon bond. Various degrees of substitution of chlorine atoms for hydrogen are possible on the remaining ten benzene carbons. There are 209 possible arrangements of chlorine atoms on the biphenyl group. Each individual arrangement or compound is called a congener. Thirteen of the 209 congeners are known to show toxic responses similar to those caused by 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD), the most toxic dioxin compound.

Historically, PCBs were produced in very large quantities both within and outside the United States. Although their uses in capacitors and transformers are well known, PCBs were also used in a wide variety of applications including some involving direct contact with the environment (e.g., building materials, paints, sealants). In the United States, commercial PCBs production started in 1929 and continued until

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[1] This estimate is based on current cause of impairment listings in the ATTAINS database (http://iaspub.epa.gov/waters10/attains_nation_cy.control?p_report_type=T) November 18, 2011; this estimate is based on the most recent CWA section 303(d) and 305(b) data reported to EPA by states and available in ATTAINS.

[2] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

1977. Importation of PCBs continued after U.S. production was banned until January 1, 1979.

PCB congeners vary markedly in their chemical and physical properties depending on the degree and position of chlorination. Important properties such as non-flammability, low electrical conductivity, high thermal stability, and high boiling point make PCBs highly stable and persistent in the environment. PCBs are also soluble in non-polar organic solvents and biological lipids, hence their tendency to bioaccumulate in living organisms.

II. Factors to Consider in Early Stages of PCB TMDL Development

With respect to development and establishment of PCB TMDLs, as with TMDLs addressing other pollutants, a variety of factors will determine the appropriate "investment" of time and resources. Motivating factors for prioritizing establishment of PCB TMDLs include the following:

- **Consent decrees** – Legal obligation may drive the establishment of these TMDLs.

- **Stakeholder interest** – National or local environmental or citizen's groups may have a specific interest in particular legacy pollutant listings or TMDL development decisions.

- **Risk to human health and the environment** – PCB "hot spots" in urban areas (e.g., a Superfund site) may be viewed as high priority for remediation or TMDL development to reduce risks to humans. When developing PCB TMDLs, consider developing targets protective for both human health and wildlife.

Other factors determining "investment" of time and resources with respect to PCB TMDLs, as with TMDLs addressing other pollutants, may include the scale at which PCB TMDLs are developed, pollutant sources, and the modeling approaches available:

- **Scale --** PCB sources tend to vary in combinations and concentrations from waterbody to waterbody, and hotspots may exist. States should be careful to think about PCB concentrations when selecting the scale at which a PCB TMDL is written. For example, the Delaware River Estuary is a large-scale multijurisdictional waterbody spanning the States of DE, PA, and NJ. A TMDL was established for each of five riverine zones in order to account for the variations in PCB concentrations throughout the estuary.[3] The Delaware River Estuary PCB TMDLs are being revised at the time of this handbook's development.

[3] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.

- **Sources --** A PCB TMDL can more quickly guide cleanup if a localized source or sources are determined to be affecting the waterbody (e.g., Superfund site, illegal discharge), and in turn, remediation tools and/or legal authorities are available to control the source(s). On the other hand, if the sources are more diffuse or not amenable to existing controls, environmental outcomes or benefits may manifest more slowly.

  Appendix Tables 1 and 2 identify common PCB sources (e.g., incinerators, wastewater treatment plants) and related databases.

- **Modeling approaches --** Various modeling approaches are available for developing PCB TMDLs. Level one, level two, and level three techniques for TMDL development are briefly contrasted below:

  - ***Level one approaches*** for PCB TMDLs include non-modeling approaches, such as assuming a proportional one-to-one relationship between PCB loadings and fish tissue, and using a bioconcentration factor to calculate a water column value. A level one approach may also involve back-calculating from the sediment targets and sediment data to determine the loading capacity. Examples of TMDLs that have used a level one approach include the Kawkawlin River in Michigan[4], Lower Okanogan River Basin in Washington[5], and TMDLs in California (San Diego Creek and Newport Bay[6], and Calleguas Creek[7]).

  - ***Level two approaches*** may involve mass balance modeling, which estimate PCB concentrations in the water column, fish tissue and sediment using sampling data. An example of an intermediate modeling approach is the Shenandoah PCB TMDL[8].

  - ***Level three approaches*** may involve linking a hydrodynamic sediment transport model with a PCB fate and transport model, and may also be linked with a watershed model. Examples of such complex models applicable to PCBs include a modified WASP-DYNHD hydrodynamic

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4 *Total Maximum Daily Load for Polychlorinated Biphenyls for the Kawkawlin River, Bay County, Michigan*, August 2002, available at http://www.epa.gov/waters/tmdldocs/3843_tmdl-kawkawlin.pdf.

5 *Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load,* October 2004, available at http://www.ecy.wa.gov/pubs/0410043.pdf.

6 *Total Maximum Daily Loads For Toxic Pollutants San Diego Creek and Newport Bay*, *California,* June 14, 2002, available at http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/sd_crk_nb_toxics_tmdl/summary0602.pdf.

7 *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.

8 "Shenandoah River PCB TMDL," available at http://www.epa.gov/reg3wapd/tmdl/VA_TMDLs/Shenandoah/index.htm.

model (used in the Delaware River Estuary PCB TMDLs[9] and the Tidal Portions of the Potomac and Anacostia Rivers TMDLs[10]).

III. Identification of Waterbodies, Pollutant Sources, Priority Ranking

As described in existing EPA guidance, TMDLs, including PCB TMDLs, should include the following[11]:

- Identification of specific waterbody and pollutant (PCBs) addressed by the TMDL.
- Identification of the pollutant sources, including quantity and location(s) of National Pollutant Discharge Elimination System (NPDES)-permitted sources within the waterbody (including regulated stormwater sources) and nonpoint sources (including non-regulated stormwater sources) (also see section VI of this handbook identifying point source loadings).
- Source assessment, including amount of PCBs from air deposition, and contribution from point and legacy sources (e.g., sediments; also see section VII on nonpoint source loadings). Although a comprehensive source assessment can be challenging, states are encouraged to consider the best available data in identifying PCB sources, and to describe how PCB sources were identified. Commensurate with historic data and information on PCB presence, budget, and other priorities, conducting a good source assessment as part of a TMDL can help ensure that all sources are accounted for, and in turn, ensure that the TMDL can be better designed to address those sources. *Method 1668C: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS* guidance describes the PCB analysis method the EPA developed for use in CWA programs and for wastewater, surface water, soil, sediment, biosolids, and tissue matrices.[12]
- Linkage to 303(d) list/Integrated Report (i.e., identify waterbody and impairment as it appears on the 303(d) list, the listing cycle, and priority ranking of the waterbody).
- Identification of other factors within the waterbody or watershed that may affect PCB loadings (e.g., watershed area, land use/land cover, population, future growth, distribution of sources and loadings, including air deposition, etc.).

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[9] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf. Note that these TMDLs are being revised at the time of this handbook's development.

[10] *Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia*, October 31, 2007, available at http://www.potomacriver.org/cms/index.php?option=com_content&view=article&id=136:tidal-pcb-tmdl&catid=41:pollution&Itemid=1.

[11] Unless otherwise noted, "existing guidance" in this handbook refers primarily to EPA's guidance for TMDL approvals, *Guidelines for Reviewing TMDLs under Existing Regulations* issued in 1992, available at http://www.epa.gov/owow/tmdl/guidance/final52002.pdf. Although some information is repeated from the 1992 guidance, this handbook does not replace that guidance.

[12] *Method 1668C: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS* guidance, April 2010, is available at http://water.epa.gov/scitech/methods/cwa/other.cfm. The EPA proposed this method in a September 23, 2010 Federal Register notice and is currently reviewing comments on the proposed rule. A decision has not been made on the promulgation of this method. Additional background on PCB analysis includes: Muir, Derek and Ed Sverko, 2006. *Analytical methods for PCBs and organochlorine pesticides in environmental monitoring and surveillance: a critical appraisal.* Anal Bioanal Chem. 386: 769-789, available at http://www.inweh.unu.edu/Coastal/CCPP/2009_Merida/Reports/Muir&Sverko_AnalBioanalChem2006.pdf.

Maryland and Virginia have recently published a source tracking study and point source guidance, respectively, that may be informative to other states. The "2005 Caged Clam Study to Characterize PCB Bioavailability in the Impaired Watersheds throughout the State of Maryland" aimed to characterize Maryland subwatersheds draining into the PCB-impaired tidal waters as (i) those with no apparent sources and (ii) those with relatively significant sources of PCB runoff.[13] Virginia Department of Environmental Quality personnel refer to a "Guidance for Monitoring of Point Sources for TMDL Development Using Low-Level PCB Method 1668" when selecting the types of facilities that should be targeted for PCB monitoring (within PCB fish impaired waterbodies) and for its standard operating procedures for sample collection, Method 1668 analysis of the samples, and submittal of PCB data to VADEQ by permitted dischargers.[14]

Pursuant to CWA section 308, the EPA may enter and inspect the facilities and records of current NPDES permit holders. Inspections ascertain the degree of compliance with requirements of the NPDES permit. During such an inspection, representatives may observe process operations, inspect monitoring equipment and lab methods, collect samples, and examine appropriate records.[15] The opportunity to observe or collect samples may help identify point sources of PCBs that otherwise would have escaped detection.

IV. Water Quality Standards and TMDL Target

TMDLs are established at a level that attains and maintains the applicable WQS, including designated uses, numeric and narrative criteria, and antidegradation policy [40 CFR §130.7(c)(1)]:

- Depending on the impairment being addressed by the TMDL, existing criteria may include human health, aquatic life, and wildlife criteria.
- The state's existing numeric PCB criterion may be a water column concentration or fish tissue value.
- TMDLs identify a numeric TMDL target or WQS criterion, a quantitative value used to attain and maintain applicable WQS, including designated uses. A TMDL also includes, as necessary depending on the nature of the sources, load allocations (LAs) and wasteload allocations (WLAs) [40 CFR § 130.2(i)].

Where a fish tissue target is used for the TMDL, appropriate justification for using a fish tissue target should be included, considering existing numeric and narrative criteria as well as designated uses.[16] For example, where a state has a narrative criterion such as

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[13] Available at http://www.mde.state.md.us/assets/document/2005_Corbicula_Study_final.pdf.

[14] *Guidance for Monitoring of Point Sources for TMDL Development Using Low-Level PCB Method 1668* , March 6, 2009, available at *http://www.deq.virginia.gov/waterguidance/pdf/092001.pdf.* Additional background on PCB analysis includes: Muir, Derek and Ed Sverko, 2006. *Analytical methods for PCBs and organochlorine pesticides in environmental monitoring and surveillance: a critical appraisal.* Anal Bioanal Chem. 386: 769-789, available at http://www.inweh.unu.edu/Coastal/CCPP/2009_Merida/Reports/Muir&Sverko_AnalBioanalChem2006.pdf.

[15] *NPDES Compliance Inspection Manual-- Appendix E: Sample Section 308 Letter*, available at http://www.epa.gov/oecaerth/resources/publications/monitoring/cwa/inspections/npdesinspect/npdesinspect.pdf.

[16] As described in the *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* ("2006 IR Guidance"), when deciding whether to identify a segment as impaired, states should determine whether there are impairments of designated uses and narrative criteria, as well as the numeric criteria. The guidance notes that, while numeric human health criteria for ambient water column concentrations of pollutants are a basis for determining

"no toxics in toxic amounts," and where a state considers there to be an impairment of a designated use due to presence of a fish consumption advisory, it may be appropriate to use a fish tissue target to interpret a narrative standard. Reliance on advisories may decrease as PCB detection levels become more precise/sensitive. The TMDL should include a demonstration of how meeting the fish tissue target will achieve WQS [40 CFR §130.7(c)].

In the San Francisco Bay PCB TMDL, the numeric target is a fish tissue concentration as fish tissue PCB concentrations are the direct cause of impairment of the designated uses. In the Palouse River Chlorinated Pesticide and PCB TMDL, numeric targets are based on fish tissue; the determination as to whether WQS have been achieved is based on fish tissue criteria.[17]

Multi-state scale

For a TMDL established for a multi-jurisdictional waterbody, in addition to the above elements, TMDLs identify WQS for each applicable state and established at a level to attain and maintain the WQS in each state. The TMDL should demonstrate that it is set at a level to achieve the WQS in each state; where the state standards are different, the TMDL should include a separate TMDL calculation to meet each standard. Large, multi-state PCB TMDL examples include the Delaware River Estuary, Ohio River, and the Potomac River and Anacostia River TMDLs. The Delaware River Estuary TMDL – being revised at the time of this guidance - addresses impairments listed in DE, NJ, and PA. The Ohio River TMDL considered WV, OH, and PA WQS; the WV standard, being most protective of human health, was used to establish TMDL endpoints within the TMDL segment. The Potomac River and Anacostia River TMDLs address impairments listed in DC, MD, and VA and are written with allocations to achieve water column concentrations less than or equal to jurisdiction-specific water quality criteria and water column and sediment concentrations less than or equal to jurisdictional fish tissue thresholds.

Total PCBs

For San Francisco Bay in California, the EPA established the PCBs water quality criterion for the protection of aquatic life based on the sum of Aroclors (i.e., the trade name given to different types of PCB mixtures) and for the protection of human health based on total PCBs (e.g., the sum of all congeners, or isomers or homologs or Aroclor analyses).[18]

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impairment, the attainment of such criteria does not always mean that designated uses are being protected. For example, a segment can be meeting numeric ambient water quality criteria, but not attaining the designated uses because fish or shellfish tissue concentrations exceed levels that are protective of human health or levels used as the basis for fish consumption advisories. See the 2006 IR Guidance for additional information on listing waters with fish or shellfish consumption advisories at http://www.epa.gov/owow/tmdl/2006IRG.

[17] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan,* July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.

[18] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf and "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California. 40 CFR Part 131.38."

In San Francisco Bay and Calleguas Creek PCB TMDLs[19], the pollutant 'total PCBs', has been defined as:

- Sum of Aroclors;
- Sum of the individual congeners routinely quantified by the Regional Monitoring Program (RMP) or a similar congener sum; or
- Sum of the National Oceanic and Atmospheric Administration (NOAA) 18 congeners converted to total Aroclors. A comparison of the sum of 18 NOAA congeners converted to Aroclor with quantified sums of Aroclors shows relatively good correlation in one study[20].

Sediment concentrations

Desorption of sediment-bound PCBs may contribute significantly to the concentrations detected in water. PCBs, particularly the highly chlorinated congeners, adsorb strongly to sediment and soil where they tend to persist with half-lives on the order of months to years. Specific examples of PCB contamination in sediment follow:

Calleguas Creek[21]

The applicable water quality criteria for protection of aquatic life in the Calleguas Creek Watershed are 0.014 µg/L [ppb] (freshwater) and 0.130 µg/L [ppb] (marine). Multiple numeric targets (including fish, sediment, and water) are considered in this TMDL as there is uncertainty that a single numeric target is sufficient to ensure protection of designated beneficial uses. In order to address impaired waters listings for PCBs in the water column, fish tissue, and sediment, multiple targets are used to protect organisms, wildlife, and human health from the potentially harmful effects of PCBs.

Sediment quality guidelines endorsed by NOAA and contained in NOAA's Screening Quick Reference Tables are selected as numeric targets for PCB sediment concentrations. Use of threshold effect level (TEL) values and effect range low (EFL) values for marine sediment represents a conservative (i.e., more protective) choice. Since these sediment guidelines are not EPA-approved sediment quality criteria, they are used as numeric targets only for reaches with sediment listings. The TMDL is calculated as a reduction in sediment concentration, which is based upon fish tissue and water concentrations (and consideration of sediment guidelines for reaches with sediment listings. In order to translate required reductions in fish tissue and water column concentrations into sediment concentration reductions, it is assumed that bioaccumulation factors for fish tissue to sediment and partition coefficients for water to sediment

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[19] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf. *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf

[20] NOAA. 1993. Sampling and Analytical Methods of the National Status and Trends Program-National Benthic Surveillance and Mussel Watch Projects 1984-1992. NOAA Technical Memorandum NOS ORCA 71, Volume 1. July, 1993. pp.I-34-39.

[21] *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.

are linear, and that a given percent reduction in fish tissue or water concentration results in an equal percent reduction in sediment concentration.

***Ohio River*[22]**

Although the operating WQS of 0.044 ng/L [0.000044 µg/L or ppb] for the water column was used to establish TMDL endpoints, WV and OH conducted a sediment survey to address water column PCB loads resulting in part from resuspension of contaminated sediments and to identify "hot spots." Specific sediment quality criteria for total PCBs have not been standardized for the Ohio River; however, *The Incidence and Severity of Sediment Contamination In Surface Waters of the United States* (EPA 823-R-97-006), also known as The National Sediment Inventory, includes multiple PCB screening levels for the protection of consumers. These values are based upon theoretic bioaccumulation potential and cancer risk levels from the primary route of human exposure to contaminated sediment: consumption of fish. Screening levels are guidelines for analysis of sediment quality data; they are not regulatory criteria.

***San Francisco Bay*[23]**

The mass of PCBs in sediments is much greater than in the water column. However, it is important to note that a numeric PCB criterion exists in California for the water column but not for sediments.

PCB uptake by biota from sediment is well documented in the scientific literature. In a shallow bay with a large sediment PCB reservoir, such as San Francisco Bay, this is the most important pathway for PCB bioaccumulation in fish. Therefore, reducing PCB concentrations in Bay sediments is the most effective means of reducing fish tissue PCB concentrations. This TMDL uses a food web model to translate the fish tissue numeric target to a corresponding sediment concentration. It then uses a waterbody (mass budget) model to predict the long-term fate of PCBs in the Bay and determine the external load of PCBs that will attain the sediment concentration goal resulting in attainment of the fish tissue numeric target.

Starting with the numeric fish tissue target of 10 ng/g [0.01 µg/g or 10 ppb], the food web model yields a corresponding concentration of 1 µg/kg [0.001 µg/g, 1 ng/g, or 1 ppb] PCBs in sediment. This human consumption-based sediment PCB concentration goal is much lower than the sediment concentration California has deemed protective of wildlife of 160 µg/kg [0.160 µg/g, 160 ng/g, or 160 ppb] total PCBs, and is therefore considered to result in attainment of all beneficial uses currently impaired by PCBs.[24]

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[22] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[23] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[24] Water quality unit conversions available at US Geological Survey "Conversion Factors and Abbreviated Water-Quality Units," http://pubs.usgs.gov/circ/circ1133/conversion-factors.html.

V. Loading Capacity – Linking Water Quality and Pollutant Sources

TMDLs identify loading capacity and reductions needed to meet WQS [40 CFR §130.2(f)].

As described in existing EPA guidance, TMDLs should provide documentation of the approach used to establish a linkage between the numeric PCB target and PCB sources, factors within the waterbody or watershed that may affect PCB loadings, the strengths and weaknesses of the approach, and the results of any modeling. As described earlier, however, factors such as likelihood of controlling the PCB source, existence of consent decrees, and risk to human health and the environment will influence level of investment devoted to modeling and analysis (see section II).

Examples of PCB fate-and-transport assumptions that may influence the calculations in an approved TMDL include ocean influence treated as background and net burial of PCBs into sediments that result in removal of PCBs from the system. Below are additional considerations to bear in mind in conducting a linkage analysis:

- A linkage analysis may include water quality modeling or other analytical approaches, although modeling is not required.
- Selecting an analytical approach depends on the type of questions to be answered and may include simple, non-modeling approaches, mass balance approaches, and more complex modeling approaches. Types of models that may be used to calculate PCB TMDLs include steady-state, hydrodynamic, and food web models. Results of air deposition modeling, as well as runoff models, may also be used as input to water quality models in a linked approach (see section II, "Factors to Consider…").
- Data on which the linkage analysis is based (e.g., waterbody characteristics, sources, fish tissue data) should be included in the TMDL.

Where a fish tissue target is used to establish a TMDL, states are encouraged to include the following items as part of the linkage analysis documentation. Unless otherwise noted, examples of each item below can be found in the San Francisco Bay PCB TMDL:

- A description of the fish tissue data (number of samples, concentration, locations, etc.)
- Identification of the specific fish species, or multiple species, and
- Identification of statistic used to calculate the baseline PCB concentration and the TMDL target (e.g., which percentile), and the rationale for the target level and fish species used.

VI. Linking Water Quality and Pollutant Sources – Point Source Loadings

As described in existing TMDL guidance, the TMDL should, to the extent data allow, identify specific point sources covered by the TMDL, and the total point source loadings. Point sources may include wastewater treatment plants, combined sewer overflows

(CSOs), municipal separate storm sewer systems (MS4), rail yards, landfills, or other locations where capacitors, transformers, or other PCB-laden products have been used.

The EPA encourages states to consider the following in determining the total point source loading of PCBs:

- States are encouraged to use data on point source loadings most representative of current conditions where relevant information is available.
- Where facility or category-specific PCB discharge data are available and of appropriate quality, states are encouraged to consider such data, and develop estimates of PCB loadings applicable to each category of sources (e.g., wastewater treatment, power plants, stormwater, and other potential PCB dischargers), rather than calculating a single average for all types of dischargers.
- Where source-specific data are not available, states are encouraged to develop representative estimates for loadings for each source category or land use.
- States should indicate how they have accounted for PCB contributions from NPDES-permitted stormwater sources in the estimate of total PCB loadings. Contributions from NPDES-permitted sources should be included in the point source estimate, and contributions from non-NPDES permitted stormwater sources may be included in the estimate of nonpoint source loadings[25]. States are encouraged to estimate contributions from specific NPDES-permitted sources such as MS4s.
- Maps showing location of key sources, land-use, and other waterbody characteristics are encouraged.

VII. Linking Water Quality and Pollutant Sources – Nonpoint Source Loadings

EPA regulations say that LAs "may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading" [40 CFR §130.2(g)]. The EPA encourages states to consider the most recent and best available data.

As described in existing TMDL guidance, the TMDL should include estimates of nonpoint source loadings (e.g., atmospheric deposition, contaminated sediment, runoff from contaminated sites, groundwater). The EPA encourages states to consider the following in developing such estimates:

- As with point sources, maps showing the location of key sources or source areas are encouraged.
- Loading estimates should account for air deposition and nonpoint sources other than those nonpoint sources containing loadings from air deposition (e.g., runoff from waste sites, legacy sources). States may wish to use runoff models to estimate PCB loadings to the waterbody from the watershed.
- While not necessary for developing the load allocation (LA), parsing out the contributions to the air deposition loading may be helpful in developing an implementation plan. Parsing out contributions to the air deposition loading is

[25] "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

contingent upon decisions regarding the appropriate level of analysis; if contribution from air is small, environmental outcomes or benefits may not be commensurate with the amount of effort spent on this analysis. For example, in contrasting two water quality impairment scenarios -- a rural Kansas scenario vs. a downtown Chicago scenario -- industry codes in the latter may be able to help identify PCB release information.

- Studies have also shown that PCB flux from water to air is significant; according to the San Francisco Bay TMDL, PCBs escape to the atmosphere from the Bay at a greater rate than they are deposited from the atmosphere, resulting in a net loss of PCBs.[26] Similarly, a Lake Michigan Mass Balance Study publication concluded from the concentration and distribution of PCB congeners collected from vapor over water, over land, and dissolved in the water, that volatilization of PCBs from contaminated waters is a major source of PCBs to the local atmosphere.[27]
- Developing a detailed source identification plan may be especially important in a highly populated urban area for protection of human health.
- Where possible, the TMDL should include estimates of the contributions from air deposition to permitted stormwater sources and account for such loadings in the point source load estimate, rather than the nonpoint source load estimate. Contributions from nonpermitted stormwater sources may be included in the nonpoint source loading estimate.[28]

Examples of PCB TMDLs that quantify nonpoint source loadings include State of Washington PCB TMDLs. In the Lower Okanogan River Basin DDT and PCB TMDL and the Palouse River Chlorinated Pesticide and PCB TMDL, sediment, runoff from waste sites, and legacy sources are considered to be nonpoint sources of focus.[29] [30]The Lower Okanogan River Basin DDT and PCB TMDL examines the relationship between contamination of fish tissue and bottom sediments.[31] Also, the Palouse River Chlorinated Pesticide and PCB TMDL evaluates total suspended solids levels from nonpoint source drainages and legacy hazardous waste sites.[32]

As mentioned earlier in this section VII, the nonpoint source loading portion of the TMDL may include, as appropriate, LAs for contaminated sites. The Delaware River Estuary PCB TMDLs, for example, acknowledge that reducing NPDES permitted point source discharges alone will not be sufficient to achieve estuary WQS. Runoff from

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[26] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[27] Hornbuckle, K.C. et al, 1993. Over-Water and Over-Land Polychlorinated Biphenyls in Green Bay, Lake Michigan. *Environ. Sci. Technol*. 27(1): 87-98, abstract available at http://www.epa.gov/glnpo/lmmb/results/pubs.html.

[28] "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

[29] *Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load,* October 2004, available at http://www.ecy.wa.gov/pubs/0410043.pdf.

[30] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan,* July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.

[31] *Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load,* October 2004, available at http://www.ecy.wa.gov/pubs/0410043.pdf.

[32] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan,* July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.

contaminated sites is a significant source of PCBs: the combined load from these 49 sites in the Delaware watershed comprises about 57% of the loading from Zone 3, 38% of the loading from Zone 4, and about 46% of the loading from Zone 5.[33]

Regional air monitoring initiatives

There may be air deposition data that can be used in TMDL development as a result of various air monitoring efforts. Air monitoring efforts include the following:

Great Lakes

Since 1990, the EPA's Great Lakes National Program Office (GLNPO) has utilized the Integrated Atmospheric Deposition Network (IADN)[34], a joint project with Canada, to determine atmospheric PCB loadings, look at trends in PCB concentrations, and use data to measure progress. IADN consists of 15 monitoring sites around the Great Lakes, five of which are US sites.

IADN also works with an EPA transformer database covering the Great Lakes States, New York, Pennsylvania and New Jersey. IADN data indicate no correlation between transformers and concentrations of PCBs (i.e., transformers are fairly closed systems); however, it is likely that data are missing (e.g., there may be discrepancies as industries have been phased out of the database). GLNPO still recommends phasing out transformers associated with PCBs as a means of restoring water quality within the Great Lakes system.

Western Airborne Contaminants Assessment Project (WACAP)

This project was initiated to determine risk to ecosystems and food webs in eight core national parks -- in the western US and Alaska -- from long-range transport of airborne contaminants. From 2002 to 2007, analysis of the concentration and biological effects of contaminants in air, snow, water, sediment, lichen, conifer needles, and fish was conducted in the national parks. Partners include the National Park Service, the EPA, US Geologic Survey, US Forest Service, Oregon State University, and University of Washington.[35]

New Jersey Atmospheric Deposition Network (NJADN)

NJ Department of Environmental Protection and Rutgers University partnered to measure concentrations of PCBs in air (gas phase), aerosol (particle phase), and precipitation at ten NJ sites representing an array of land-use regimes at regular intervals between 1997 and 2003. Based on the measured gas, particle, and precipitation phase concentrations, NJADN researchers estimated the atmospheric deposition flux, or flow, of total PCBs at the different sites.[36]

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[33] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.

[34] USEPA IADN website is available at http://www.epa.gov/glnpo/monitoring/air2/index.html.

[35] National Park Service and USEPA "Western Airborne Contaminants Assessment Project" available at http://www.nature.nps.gov/air/Studies/air_toxics/wacap.cfm and http://www.epa.gov/nheerl/wacap/, respectively.

[36] NJ Dept. of Environmental Protection "New Jersey Atmospheric Deposition Network" available at http://www.state.nj.us/dep/dsr/njadn/ and Atmospheric Deposition: PCBs, PAHs, organochlorine pesticides, and Heavy Metals available at http://www.nj.gov/dep/dsr/trends2005/pdfs/atmospheric-dep-pcbs.pdf.

San Francisco Estuary Institutes' Regional Monitoring Program for Trace Substances (RMP) and Watersheds Science Program

The RMP is made up of a group of representatives from wastewater treatment plants, stormwater agencies, industrial dischargers, and the San Francisco Bay Water Board. The RMP works to support the development of TMDLs and other water quality attainment strategies for the San Francisco Bay.

The Watersheds Science Program provides Bay area environmental managers with quality science information in the context of the whole system (watersheds, the airshed, wetlands, and the Bay).[37]

Chesapeake Bay Atmospheric Deposition Network Nutrient-Toxics Deposition Monitoring Program (CBAD-NT)

The CBAD-NT was conducted at urban and non-urban sites along the shoreline of the Chesapeake Bay during 1995-1999. The primary objective of the CBAD-NT study was to provide the best possible estimates of total, annual atmospheric loadings of nitrogen-based nutrients and organic contaminants, including PCBs, directly to the surface waters of the Chesapeake Bay, and to conduct a study of a series of key processes for estimating reductions in deposition to the watershed and delivered loads to the tidal bay.[38]

VIII. Wasteload Allocation (WLA)

TMDLs include WLAs which identify the portion of the loading capacity allocated to individual existing and future point sources [40 CFR §130.2(h), 40 CFR §130.2(i)].

Consistent with the 2006 decision by the D.C. Circuit Court of Appeals in *Friends of the Earth v. EPA*, the EPA has recommended that TMDL allocations be expressed as a daily load[39]. Because PCB levels in fish represent bioaccumulation over longer periods of time, it may be appropriate to express allocations in PCB TMDLs as both an annual and daily load. If appropriate, states may also express allocations using other averaging periods, such as seasonal, in addition to a daily load.

Stormwater

NPDES-permitted stormwater discharges are included in a TMDL's WLA [40 CFR §130.2(h)[40]].

Here are three examples of TMDLs that address stormwater within their WLA:

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[37] San Francisco Estuarine Institute, "Programs" website, available at http://www.sfei.org/programs.

[38] Maryland Power Plant Research Program, "Chesapeake Bay Atmospheric Deposition Network Nutrient-Toxics Deposition Monitoring Program" available at http://www.esm.versar.com/pprp/features/Atmosdep/regional_sites/cbadsnt/cbadnt_prog.html.

[39] See Establishing TMDL "Daily" Loads in Light of the Decision by the US Court of Appeals for the DC Circuit in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015, (April 25, 2006) and Implications for NPDES Permits at http://www.epa.gov/owow/tmdl/dailyloadsguidance.html. Note that, as described in the latter memo, the Court decision regarding daily loads does not imply that NPDES permit limits must be expressed in daily terms.

[40] See "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

San Francisco Bay[41]

The TMDL identifies the two major sources of PCB loadings to the Bay as Delta inflow from the Central Valley watershed and urban stormwater discharges. Sediments from the Central Valley watershed carry a large mass of PCBs but are lower in concentration than in-Bay sediments, potentially helping to reduce current impacts of PCBs on the Bay by burying more contaminated sediments. Implementation of the TMDL is thus focused on reducing sediment PCB concentrations by controlling PCB sources in urban stormwater discharges.

A potential means to reduce urban stormwater discharge of PCB loads might be to strategically intercept and route stormwater to municipal wastewater treatment facilities. The TMDL designates a separate WLA for discharges associated with urban stormwater treatment via municipal wastewater treatment facilities, since such actions will result in increased PCBs loads from municipal wastewater dischargers. The individual WLAs for municipal wastewater treatment works dischargers reflect current performance levels.

The TMDL also includes WLAs for stormwater discharges for each county. These WLAs apply to all NPDES permitted municipal stormwater discharges. These WLAs implicitly include all current and future permitted discharges within the geographic boundaries of municipalities and unincorporated areas within each county. Examples of sources of PCBs in stormwater discharges include, but are not limited to, California Department of Transportation (Caltrans) roadways and non-roadway facilities, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

Delaware River Estuary[42]

In the 2003 Stage 1 PCB TMDL for the tidal Delaware River, point sources include all municipal and industrial discharges subject to regulation by the NPDES permit program, including CSOs and stormwater discharges. This Stage 1 TMDL explicitly assigns a portion of each of the different estuary zone WLAs to storm water discharges.

In developing the Stage 1 TMDLs, the WLAs were calculated for traditional point source discharges based upon effluent concentrations and the actual effluent flows during a one-year model cycling period.

Calleguas Creek[43]

An aggregate concentration-based WLA was developed for MS4s. The aggregate allocation will apply to all NPDES-regulated municipal stormwater

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[41] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[42] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.

[43] *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.

discharges in the watershed. Stormwater WLAs will be translated into the NPDES permits as ambient receiving water PCB concentration limits measured at instream discharge points for each subwatershed. They will be achieved through the implementation of best management practices (BMPs) as outlined in the implementation plan. Compliance will be determined through the measurement of in-stream water quality, sediment, and fish tissue measurements at the base of each subwatershed. To facilitate stormwater co-permittees measuring compliance in all six subwatersheds, additional monitoring stations will be needed in four of the subwatersheds mentioned within the TMDL.

Reserve capacity and WLA

A portion of a TMDL's loading capacity may be set aside as a "reserve" to allow for future increases in pollutant loading. Use of a reserve may be relevant to PCB TMDLs in particular, as there may be unexpected discharges of PCBs not identified in the initial TMDL. The concept of reserving loading capacity for "future" sources of pollutants is expressly included in the definitions of "wasteload" and "load" allocations [40 CFR § 130.2(g), 40 CFR § 130.2(h)]. Thus, a TMDL may assign a WLA or LA to a particular source that is larger than its current pollutant contribution to allow room for future loading increases by that source (in other words, using design capacity of a facility in setting its WLA). A TMDL may also set aside a gross, unallocated "reserve" (as part of the overall WLA, the overall LA, or the overall total loading capacity) to account for increased future pollutant contributions from a variety of existing or future sources. In all cases, the sum of the WLAs, LAs, the margin of safety (if an explicit load has been defined), and any reserve capacity must be equal to or less than the loading capacity ($TMDL = \Sigma WLA + \Sigma LA + MOS + Reserve$). The EPA does not support trading of pollutants considered by the EPA to be persistent bioaccumulative toxics (PBTs).[44]

In the case of PCB TMDLs for waterbodies where there are no permitted or un-permitted point source dischargers at the time the TMDL is established, inclusion of a reserve capacity in a TMDL's WLA could allow for permits for newly identified sources.

A reserve for future pollutant contributions from point sources may be included in the TMDL as a WLA. The EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to the individual existing and future point source(s) [40 CFR §130.2(h), 40 CFR §130.2(i)]. Reserve capacity may be incorporated into the individual WLA of each individual point source. One method is to allocate a WLA at design flow of a facility when the facility is currently permitted under capacity. Individual WLA reserves may also be expressed as a percentage of the initial WLA as calculated in the Delaware River Estuary Volatile Organics and Toxicity TMDLs.[45]

It may be reasonable to express allocations from multiple point sources as a single categorical WLA when data and information are insufficient to assign each source or

[44] USEPA "Final Water Quality Trading Policy," January 2003, available at http://www.epa.gov/owow/watershed/trading/finalpolicy2003.html.

[45] *Wasteload Allocations for Volatile Organics and Toxicity: Phase I TMDLs for Toxic Pollutants in the Delaware River Estuary,* December 1998, available at http://www.state.nj.us/drbc/regs/wlareport.pdf.

outfall individual WLAs.[46] In a PCB TMDL, it may thus be reasonable to set aside a gross WLA reserve to account for the following PCB point source loadings: (a) post-TMDL identified discharges from existing NPDES permittees that were not captured in a specific WLA (in other words, newly identified discharges from NPDES permittees that did not have PCB limits previously); and (b) newly identified dischargers (those not holding any NPDES permits previously).

Protecting Local Water Quality

Where a TMDL includes an aggregate allocation, states are strongly encouraged to include specific information on how NPDES permits, including stormwater permits, will be implemented. It is recommended that the TMDL specifically state that, at the time of permit issuance, an analysis will be conducted to determine that there will be no localized exceedances of the WQS. For example, three stormwater outfalls are located in hypothetical Smith Creek watershed with an aggregate allocation of 30 units per day. One outfall is considerably closer to Smith Creek than the other two and wants a larger allocation of 12 units per day. The two remaining outfalls would then have an allocation of 9 units per day each. These allocations may be appropriate as long as they will not be contributing to localized exceedances of the WQS or designated uses at any of the three outfalls. Another option, using the same three stormwater outfalls, would be to assign a smaller allocation to the closer outfall to Smith Creek if necessary to implement WQS and designated uses due to the proximity of the outfall to the impaired waterbody.

IX. Load Allocation (LA)

TMDLs include a LA, which identifies the portion of the loading capacity attributed to existing and future nonpoint sources and natural background. LAs may range from reasonably accurate estimates to gross allotments [40 CFR §130.2(g)].

As described in VIII above, contributions from NPDES-permitted stormwater sources that include contributions from air deposition should be included in the WLA. Contributions from air deposition in stormwater discharges not currently subject to NPDES regulation may be included in the LA.[47]

As with WLAs, the LAs should be expressed as a daily load; however, given bioaccumulative properties of PCBs, TMDL writers may wish to express allocations as both an annual and daily load.

X. Margin of Safety (MOS)

TMDLs include an MOS to account for uncertainty in relationship between pollutant loads and quality of receiving water [CWA §303(d)(1)(C), 40 CFR §130.7(c)(1)]. As described in existing guidance, the MOS may be implicit (conservative assumptions in

[46] "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

[47] See "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

the calculations or overall approach) or explicit (e.g., build in additional percent load reduction). For an implicit MOS, the TMDL should describe the assumptions used to account for the MOS. The MOS in a TMDL is distinct from the conservative assumptions that may be incorporated into a WQS.

Implicit MOS

Examples of implicit MOS in PCB TMDLs include, but are not limited to, the following:

- Conservative approach to derive fish tissue target[48]
- Conservative assumptions of (1) mass assumed to be completely conserved as it passes through the study area and (2) existing OH River tributary loadings estimated using conservative approach[49]
- Combination of several conservative assumptions, including (1) selecting the greater percent reduction required of water or fish tissue concentrations as the basis for determining the percent reduction required in sediment, (2) ensuring protection of downstream subwatersheds from upstream inputs by reducing the allowable concentration for upstream subwatersheds where downstream allowable concentrations are lower, (3) decision to use the lower of the allowable concentration or the numeric target for sediment as the WLA and LA for all reaches with 303(d) listings for sediment.[50]

Explicit MOS

A range of explicit MOS values from five percent to 20% of the total loading were observed in the sample of TMDLs below. The choice of a specific, explicit MOS will depend on the facts of each particular TMDL. States are encouraged to document and explain the basis for the particular MOS value they choose.

The Palouse River Chlorinated Pesticide and PCB TMDL[51] recognizes the uncertainties associated with stormwater and WWTP loading of PCBs and dieldrin, and includes a safety margin of 20% of the loading capacities of the South Fork and mainstem Palouse River.

Within the Newport Bay and San Diego Creek TMDLs for toxic pollutants[52], a 10% explicit MOS was applied to account for uncertainties in the analysis. A 10% MOS was subtracted from the loading capacity or existing load, whichever was the smaller value. An explicit MOS was deemed appropriate because of significant uncertainty in the analysis of pollutant effects, loads, fate (i.e., chemical transformations and degradation following discharge), and transport in the watershed. The data supporting the TMDLs

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[48] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[49] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[50] *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.

[51] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan*, July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.

[52] *Total Maximum Daily Loads For Toxic Pollutants San Diego Creek and Newport Bay, California,* June 14, 2002, available at http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/sd_crk_nb_toxics_tmdl/summary0602.pdf.

were somewhat limited. Additionally, for all pollutants the TMDLs also incorporate an implicit MOS because numerous conservative assumptions were made to ensure that the analytical methods applied are environmentally protective.

The Delaware River Basin Commission's (DRBC's) Toxic Advisory Committee recommended use of an explicit MOS of five percent within the Stage 1 PCB TMDLs. This recommendation, which was adopted in the TMDLs, was based upon the use of a one-year cycling period for the hydrodynamic and water quality model. Since the conditions under which the TMDL is determined, like tributary flows, are related to the long-term conditions and not to design conditions associated with human health WQS for carcinogens (such as the harmonic mean flow of tributaries), expression of the MOS as an explicit percentage of each zone TMDL was considered more appropriate than an implicit MOS.

XI. Critical Conditions and Seasonal Variation

TMDL calculations take into account critical conditions for stream flow, loading and water quality parameters [40 CFR §130.7(c)(1)]. For PCBs, critical conditions might be based upon freshwater flow rates due to precipitation regardless of season. Thus, the applicable allocation for a given source does not depend on time of year, but on actual stream flow (or associated sediment disposition rate for organochlorine compounds) at time of discharge. Wet weather events, which may occur at any time of the year, produce extensive sediment redistribution and transport downstream. This would be considered the critical condition for loading; however, the effects of organochlorine compounds are manifested over long time periods in response to bioaccumulation in the food chain. Therefore, short term loading variations (within the time scale of wet and dry seasons each year) are not likely to cause significant variations in beneficial use effects. The Newport Bay and San Diego Creek TMDLs[53], for example, consider seasonal variations in loads and flows but are established in a manner that accounts for the longer time horizon in which ecological effects may occur.

As PCBs bioaccumulate over time, annual variations may be considered more important than seasonal variations, particularly if a fish tissue target is used. States are encouraged to indicate how, when, and where fish tissue data were collected.

XII. Reasonable Assurance

When a TMDL is developed for waters impaired by point sources only, the issuance of an NPDES permit provides the reasonable assurance that the WLAs contained in the TMDL will be achieved. This is because 40 CFR 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.[54]

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[53] *Total Maximum Daily Loads For Toxic Pollutants San Diego Creek and Newport Bay, California,* June 14, 2002, available at http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/sd_crk_nb_toxics_tmdl/summary0602.pdf.

[54] May 2002 "Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992," available at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/final52002.cfm.

When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, the EPA's 1991 TMDL Guidance states that the TMDLs should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for the EPA to determine that the TMDL, including the LAs and WLAs, has been established at a level necessary to implement WQS. The EPA's August 1997 TMDL Guidance also directs Regions to work with states to achieve TMDL LAs in waters impaired only by nonpoint sources. [55]

For TMDLs for PCB-impaired waters, the reasonable assurance demonstration is challenging because of the nature of the sources and the inability to trade allocations among nonpoint and point sources. Each TMDL's demonstration of reasonable assurance is, of necessity, case-specific and therefore states are encouraged to contact their EPA Region.

XIII. Post-TMDL Monitoring

States are encouraged to implement a multi-media monitoring program, commensurate with prevalence and availability of PCBs, budget, and other priorities, to track progress in reducing emissions and loadings from PCB source categories and, in turn, to track progress toward the TMDL target.

Where discharge data on particular sources or source categories is not available when developing the TMDL, follow-up monitoring by those sources is encouraged. Further monitoring can assist in refining the loading estimates and allocations using an adaptive management approach. States are encouraged to implement as many elements of a multi-media program as possible to reduce PCB loadings, depending on resources.

A monitoring plan should identify which parameters will be monitored and the frequency of monitoring. States may also wish to identify a baseline against which to measure progress.

Delaware River Estuary

The 2003 Stage 1 TMDLs for PCBs within the tidal Delaware River Estuary anticipate that facilities that discharge to the river, including its tributary streams, will develop and implement a pollutant minimization plan (PMP) [56]. This PMP is expected to include a list of all known and suspected point and nonpoint sources of PCBs, a description of studies used to track down PCBs (i.e., evaluate the most appropriate sampling and analytical techniques for identifying PCB contamination to the municipal utility authority

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[55] May 2002 "Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992," available at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/final52002.cfm.

[56] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.
PCB TMDLs, Pollution Minimization Plans, and Source Trackdown in Camden City, August 2008, available at http://www.state.nj.us/dep/dsr/health/trackdown-rps.pdf.

(MUA) collection system and identifying upland sources), a description of actions to minimize the discharge of PCBs, and a proposed time frame for PCB load reductions.

Innovative methods explored in this study included the use of PCB analytical Method 1668a to attain high sensitivity in sampling, including quantification of 124 separate PCB congeners as a means to identify unique source signatures, the use of passive in-situ continuous extraction samplers (PISCES) for sample integration over long time periods (14 days), the use of inexpensive immunoassay techniques for sampling PCBs in street soils, and the use of NJ Department of Environmental Protection's hazardous waste site's electronic data collection system in conjunction with a geographic information system (GIS) to screen and isolate potential upland sources for further investigation.[57] The pilot study was carried out in two phases. Phase 1 involved only in-sewer sampling of wastewater to identify sewersheds with PCB hotspots. Phase 2 followed up on this sampling with additional in-sewer sampling but also with more detailed street soil sampling for PCBs in front of suspect facilities.

Ohio River

The Ohio River PCB TMDL[58] states that initial actions were to be focused on addressing current point sources of PCBs. Limited sampling identified publicly owned treatment works (POTWs) as possible point sources. Additional monitoring was deemed necessary to better quantify the loadings from these facilities. Once loadings are established possible control strategies can be considered.

Limited high-volume water sampling conducted on the effluent at two municipal wastewater treatment plants within the TMDL study area revealed the presence of PCBs. Similar results were found at another POTW downstream of the study area. Considering the large number of POTWs within the entire Ohio River Basin, the potential loadings from these facilities may be significant. The TMDL recommended additional monitoring be conducted to more accurately quantify the PCB loads discharged from POTWs and to determine the amount of PCBs attributable to source water loadings.

XIV. Implementation

An implementation plan is not a federally-required element of a TMDL that is subject to EPA approval. However, a TMDL implementation plan is required in some states as a matter of state law. The EPA encourages states to develop an implementation plan for PCB TMDLs even where one is not required. In addition to implementing PCB TMDLs through NPDES permits, a number of additional implementation authorities, sources, and approaches, which could be involved in development of implementation plans for PCB TMDLs, are provided here.

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[57] Note *Method 1668C: Chlorinated Biphenyl Congeners in Water Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS* guidance, April 2010, available at http://water.epa.gov/scitech/methods/cwa/other.cfm, describes the updated analytical method version (1668C).

[58] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

Superfund and Toxic Substances Control Act

In implementing a PCB TMDL, the EPA recommends coordinating with the Superfund Program. TMDLs established by states, territories or authorized Indian tribes may or may not be promulgated as rules. Therefore, TMDLs established by states, territories, or authorized Indian tribes, should be evaluated on a regulation-specific and site-specific basis. EPA-established TMDLs are not promulgated as rules, are not enforceable, and, therefore, are not appropriate or relevant and appropriate requirements (ARARs). Even if a TMDL is not an ARAR, it may aid in setting protective cleanup levels and may be appropriately a TBC ["to be considered"]. Project managers should work closely with regional EPA Water program and state personnel to coordinate matters relating to TMDLs. The project manager should remember that even when a TMDL or wasteload allocation is not enforceable, the water quality standards on which they are based may be ARARs. TMDLs can also be useful in helping project managers evaluate the impacts of continuing sources, contaminant transport, and fate and effects. Similarly, Superfund's remedial investigation and feasibility study may provide useful information and analysis to the federal and state water programs charged with developing TMDLs.[59]

The principal federal law regulating PCBs is the Toxic Substances Control Act (TSCA) and its implementing regulations, including regulations at 40 CFR 761[60]. EPA regulations under TSCA allow discharge of water to a treatment works or navigable waters if the PCB concentration is less than 3 ug/L (parts per billion), or if the concentration complies with a PCB water discharge limit in the discharger's CWA permit [40 CFR 761(b)(1)(ii)].

Although PCBs were banned in 1979, the EPA's regulations under TSCA allow the inadvertent manufacture of PCBs as the result of some manufacturing processes. Under the regulations, a manufacturer can have up to 50 ppm PCBs in products leaving the manufacturing site (except components of detergent bars can only have less than 5 ppm), so long as the annual average concentration in those products is less than 25 ppm, and so long as the manufacturer complies with other restrictions, including proper disposal of any PCB wastes produced [40 CFR 761.20(b), 761.3]. EPA regulations also allow the continued use of PCBs in various electrical and other applications, under certain conditions [40 CFR 761.30].

Examples of Superfund Program response actions that have been initiated to help clean up waterways and sediments contaminated with PCBs include the Lower Duwamish Waterway Site Washington and the Hudson River Site in New York (see "Sediment Sources: Dredging and Excavation" further below).

Air Sources

When developing PCB TMDLs, states are not required to identify contributions from individual air sources or air source categories; however, identifying such contributions

[59] EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf .

[60] http://www.access.gpo.gov/nara/cfr/waisidx_08/40cfr761_08.html

can assist in developing a targeted implementation plan. PCBs may be released to the air from equipment or materials that are still in use, such as transformers and fluorescent light ballasts; disposal sites containing transformers, capacitors, and other PCB waste; incineration of PCB-containing wastes, particularly PCB-containing oils; and redistribution and transport of PCBs already present in the environment.[61] For PCB air sources over which a state has control, particularly the most significant sources, TMDL implementation may be based on existing delegated and/or approved federal air program requirements. States are encouraged to address air sources not already covered by federal requirements. States should also evaluate cumulative emissions from air sources other than the most prominent (i.e., secondary, tertiary) and adopt controls as appropriate.

Water Pollutant Minimization Plans (PMPs)

The EPA's existing regulations require NPDES permits to include WQBELs to control all pollutants or pollutant parameters that the permitting authority determines are or may be discharged at a level which will cause, have a reasonable potential to cause, or contribute to an excursion above any state WQS, including state numeric and narrative criteria for water quality [40 CFR §122.44(d)(1)(i)]. In the case of waters impaired by PCBs, states may consider implementing compliance schedules and cost-effective pollutant minimization plans (PMPs) for wastewater treatment plants and industrial discharges [see "Pollutant Minimization Plans (PMPs)," below]. For implementation of the WLA by permitted sources, also see discussion under previous sections VIII ["Wasteload Allocation (WLA)"] and XII ("Reasonable Assurance").

Sediment Sources

TMDL implementation plans might discuss anticipated remediation measures. Remediation approaches for PCBs include capping and dredging. Descriptions of these measures and examples within PCB TMDL implementation plans or discussions follow:

Capping

In-situ capping refers to the placement of a subaqueous covering or cap of clean material over contaminated sediment that remains in place. Caps are generally constructed of clean sediment, sand, or gravel, but can also include geotextiles, liners, or the addition of material, such as organic carbon, to attenuate the flux of contaminants into the overlying water.[62] The San Francisco Bay TMDL discusses cost estimates and potential implications of capping in-bay sediments for area noise and cultural resources.[63]

Dredging and excavation

Dredging and excavation are the two most common means of removing contaminated sediment from a waterbody, either while it is submerged (dredging) or after water has been diverted or drained (excavation). Both methods typically

[61] "Polychlorinated Biphenyls (PCBs) (Arochlors) ," January 2000, available at http://www.epa.gov/ttn/uatw/hlthef/polychlo.html.

[62] More details on in-situ capping can be found in EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf.

[63] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

necessitate transporting the sediment to a location for treatment and/or disposal. They also frequently include treatment of water from dewatered sediment prior to discharge to an appropriate receiving waterbody.[64] One of the principal advantages of dredging and excavation is often that, if they achieve cleanup levels for the site, they may result in the least uncertainty regarding future environmental exposure to contaminants because the contaminants are removed from the aquatic ecosystem and disposed in a controlled environment.[65] The San Francisco Bay PCB TMDL discusses the cost of dredging and disposal of in-bay sediments.[66] The challenges of dredging, including high cost and risks of habitat destruction and resuspension of contaminants are recognized in the Ohio River TMDL.[67]

A collection of technical reports on PCB treatment technologies, including sediment capping, in-situ thermal desorption-destruction of PCBs, and phytoremediation of persistent organic compounds is available through the EPA's Technology and Innovation Program[68]. The EPA, United Nations Environment Programme, and US Army Engineer Research and Development Center are among the developers of these resources.

Examples of Superfund contaminated sediment cleanups include the Lower Duwamish Waterway in Washington and the Hudson River in New York.

The Lower Duwamish Waterway Cleanup Site covers a 5.5 mile waterway that empties into Elliot Bay in Seattle as well as the 32 square mile basin that discharges into the Duwamish. Past and present activities have left a legacy of chemical pollution in the waterway and in the sediment. Pollutants include PCBs, dioxins, furans, and other chemicals. In 2001-2002, the EPA and Washington Department of Ecology listed the Lower Duwamish Waterway under the federal Superfund law and Washington's Model Toxic Substances Control Act because of the health risks to people and animals exposed to contaminated sediments. Currently, the EPA is overseeing development of a Feasibility Study and is developing a recommendation for the cleanup. The Proposed Plan will be available for public comment in early 2012. Meanwhile, PCBs have driven several of the "Early Action" cleanup areas' sediment investigation and removal plans.[69]

The Hudson River PCBs Site encompasses a nearly 200-mile stretch of the Hudson River in eastern New York State from Hudson Falls, New York to the Battery in New York City. The EPA named this a Superfund site, contaminated by PCBs, in 1984.

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[64] More details on in-situ capping can be found in EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf.

[65] EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf.

[66] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[67] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[68] "Contaminant Focus: Polychlorinated Biphenyls (PCBs) – Treatment Technologies," available at http://www.clu-in.org/contaminantfocus/default.focus/sec/Polychlorinated_Biphenyls_(PCBs)/cat/Treatment_Technologies/.

[69] USEPA, "Lower Duwamish Waterway Superfund Site" website, available at http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish.

From approximately 1947 to 1977, the General Electric Company (GE) discharged as much as 1.3 million pounds of PCBs from its capacitor manufacturing plants into the Hudson River. Since 1976, high levels of PCBs in fish have led New York State to close various recreational and commercial fisheries and to issue fish consumption advisories,

Phase 1 dredging for Hudson River cleanup took place between May and November 2009 in a six-mile stretch of the Upper Hudson River near Fort Edward in New York. Phase 1 was designed to address approximately 10 percent of the material to be dredged over the six-year project timeframe. At the end of Phase 1, an estimated 283,000 cubic yards of PCB-contaminated sediment had been removed from the river. Phase 2 (final phase) dredging began in June 2011. During this phase of dredging, GE will remove about 2.4 million cubic yards of sediment from a forty-mile section of the Upper Hudson River. [70]

Multi-media Sources

PCBs can be released from disposal of products discarded as solid waste, ongoing use of PCB-containing equipment and materials, industrial processes, and other sources. These releases may have cross-media impacts. Examples of approaches to address these sources include monitored natural recovery and PMPs (below), as well as working with industry, local governments, and the general public through outreach and communication regarding proper disposal of PCB-containing products.

Monitored Natural Recovery (MNR)

Although burial by clean sediment is often the dominant process relied upon for natural recovery, multiple physical, biological, and chemical mechanisms frequently act together to reduce risk. Evaluation of MNR should usually be based on site-specific data, including multiple lines of evidence such as decreasing trends of contaminant levels in fish, in surface water, and in sediment. Project managers should evaluate the long-term stability of the sediment bed and the mobility of contaminants within it. Contingency measures should be included as part of a MNR remedy when there is significant uncertainty that the remedial action objectives will be achieved within the predicted time frame. Generally, MNR should be used either in conjunction with source control or active sediment remediation.

While this approach to PCB contamination has a relatively low financial cost, these natural processes act very slowly on persistent, bioaccumulative pollutants such as PCBs (estimates from Indiana University[71] calculate the half-life of PCBs at between 13 and 17 years and another estimate in the Central Valley puts half-life at 56 years[72]).[73] MNR involves analyzing the processes that will result in

[70] USEPA, "Hudson River PCBs" website, available at http://www.epa.gov/hudson/.

[71] Venier, M. and Hites, R.A. Time Trend Analysis of Atmospheric POPs Concentrations in the Great Lakes Region Since 1990, *Environ. Sci. Technol.*, 2010, *44* (21), pp 8050–8055. Venier, M. and Hites, R.A. Regression Model of Partial Pressures of PCBs, PAHs, and Organochlorine Pesticides in the Great Lakes' Atmosphere, *Environ. Sci. Technol.*, 2010, *44* (2), pp 618–623.

[72] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

achieving cleanup objectives and monitoring the recovery to ensure that cleanup is proceeding as expected. MNR has been selected as a component of the remedy for contaminated sediment at over one dozen Superfund sites. Historically, at many sites MNR is combined with dredging or in-situ capping of other areas of a site. Although reduced contamination in sediments following effective source control has been observed at some of these sites, long-term monitoring data on fish tissue are not yet available at most sites to document continued risk reduction.[74]
When considering MNR versus a more aggressive remedy, Superfund cleanup levels are based on regulatory standards that constitute ARARs such as WQS, or where not available or sufficiently protective, based on risk to human health and the environment. For human health carcinogenic cleanup levels are based on a 10^{-4} to 10^{-6} excess cancer risk range (i.e., 1/10,000 - 1/1,000,000 risk range) with 10^{-6} as the point of departure. For toxicity endpoint, the cleanup level is based on a Hazardous Index of one or less. Cleanup levels are set to protect ecological receptors.

Factors to take into account when considering MNR versus other remedies include an analysis of the processes that are contributing to achieving the cleanup levels through MNR, the expected time frame to achieve the protective levels, and how this compares against other more active remedies. General factors for evaluation of MNR need to be evaluated on a case-by-case basis. Examples of site conditions that might support use of MNR may include such factors as the sediment bed is reasonably stable and likely to remain so, and sediment is resistant to resuspension (e.g., cohesive or well-armored sediment).

Several PCB TMDLs consider natural recovery within their implementation sections. For example, the Ohio River TMDL looks toward addressing PCB contamination present in sediments; options include natural attenuation.[75] An ongoing annual fish tissue monitoring program makes data and information available to assess and define current and future long-term trends in PCBs in the Ohio River system.[76] Fish tissue monitoring measures trends and natural attenuation progress; it provides information on impacts from sediment concentration (atmospheric deposition may also affect fish tissue concentration).

Pollutant minimization plans (PMPs)

In the case of waters impaired by PCBs, states may consider implementing cost-effective PMPs.
For PCB control, a PMP might include identification of all known and suspected point and nonpoint sources of PCBs, a description of studies used to identify

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[73] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[74] *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf.

[75] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[76] These data can be found on Ohio River Valley Water Sanitation Commission's website at http://www.orsanco.org/fish-tissue/193.

PCB sources, a description of actions to minimize prospective discharge of PCBs, a proposed time frame for PCB load reductions, a method to demonstrate progress, and ongoing PCB monitoring. As an example, PMP elements for PCBs were identified in a DRBC resolution and guidance manual[77]. DRBC has aggregated resources for completing and implementing PMPs -- including a handbook on PCBs in electrical equipment, a report on technological feasibility for proposed water quality criteria for NJ, and a NJ pilot "trackdown" program for PCBs in the sewer system -- on its website[78].
The primary objective of a recent Camden PCB trackdown study was to identify PCB sources entering storm drains and CSOs in order to abate PCB transport to the Delaware River, thereby decreasing bioaccumulation in foodfish and decreasing risk to human consumers. To that end, the State of New Jersey narrowed down the universe of potential PCB sources in Camden County MUA's collection system from a county-wide range of potential sources and municipalities to just a few specific neighborhoods, industry types and streets in Camden City (77% of PCB load). Methods used included soil collection, enzyme-linked immunosorbent assays (ELISA), and high resolution gas chromatography/high resolution mass spectrometry. [79]

DRBC's[80], recommended actions to minimize known and probable on-site PCB sources include the following:

- Removal;
- Engineering controls (such as caps and containment dikes);
- Fluid changeout;
- Substitutions / modifications of raw or finished materials used in the treatment process;
- Modifications to material handling including transport; and
- Remedial activities for spills and leaks (current or legacy).

Recommended minimization activities for probable collection system sources include the following[81] [82]:

- Indirect Discharge Permit review and amendment;
- Recommendations for improved and upgraded industrial pre-treatment;
- Remedial activities for spills and leaks (current or legacy);
- Recommendations for remediation by other agencies under other regulatory programs; and
- Hydraulic controls to minimize PCB mass loads through CSOs.

[77] *Pollution Minimization Plans, and Source Trackdown in Camden City,* August 2008, available at http://www.state.nj.us/dep/dsr/health/trackdown-finalreport.pdf.

[78] Available at http://www.state.nj.us/drbc/PMP_Resources/index.htm.

[79] *PCB TMDLs, Pollution Minimization Plans, and Source Trackdown in Camden City,* August 2008, available at http://www.state.nj.us/dep/dsr/health/trackdown-rps.pdf.

[80] *Recommended Outline for Pollution Minimization Plans for Polychlorinated Biphenyls in the Delaware Estuary*, January 26, 2006, available at http://www.state.nj.us/drbc/PMP-POTW-012606.pdf

[81] *Recommended Outline for Pollution Minimization Plans for Polychlorinated Biphenyls in the Delaware Estuary*, January 26, 2006, available at http://www.state.nj.us/drbc/PMP-POTW-012606.pdf.

[82] Also see 40 CFR Part 403; these regulations set forth requirements for publicly owned treatment works (POTWs) to control discharges into the collection system and POTW treatment plant, as well as requirements for industries that discharge to the POTW.

Where appropriate, states may wish to use "adaptive implementation," which is "an iterative implementation process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities."[83] In implementing a TMDL, states may wish to modify implementation activities as new information on assumptions in the TMDL, such as previously uncharacterized dischargers as described in section V, becomes available. PCB TMDLs have also used a "staged" implementation approach, in which implementation is staged over a period of time, with reduction goals to be met in several phases.[84]

[83] See "Clarification Regarding "Phased" Total Maximum Daily Loads," August 2, 2006, at http://www.epa.gov/owow/tmdl/tmdl_clarification_letter.html and *Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges,* September 2007, at http://nicholasinstitute.duke.edu/water/quality/adaptive-implementation-of-water-quality-improvement-plans-opportunities-and-challenges.

[84] See *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.

Appendix: PCB Sources

Table 1. Databases for PCB Sources			
Database	**Description**	**Location**	**Comments**
Toxic Release Inventory (TRI)	Contains information on releases of nearly 650 chemicals and chemical categories from industries, including manufacturing, metal and coal mining, electric utilities, commercial hazardous waste treatment, among others.	www.epa.gov/tri	Other sources for information on toxic chemical site releases: www.epa.gov/triexplorer --www.epa.gov/enviro --www.scorecard.org --www.rtk.net
Permit Compliance System (PCS)	Provides information on companies which have been issued permits to discharge waste water into rivers. You can review information on when a permit was issued and expires, how much the company is permitted to discharge, and the actual monitoring data showing what the company has discharged.	http://www.epa.gov/enviro/html/pcs/	
National Priority List (NPL)	Lists national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation.	http://www.epa.gov/superfund/sites/query/basic.htm (Basic Query)	--Locate NPL sites, check their cleanup progress, and get information on new and proposed NPL sites. --Query parameters include contaminant of concern (e.g., PCBs)
Envirofacts Warehouse Database	Provides access to several EPA databases (e.g., PCS, TRI) to provide information about environmental activities that may affect air, water, and land anywhere in the United States.	http://www.epa.gov/envirofw/	Learn more about environmental activities in your area or generate maps of environmental information here.
EPA Transformer Registration and PCB Activity Databases	Provides information on companies or people who have PCB transformers, are conducting business involving the disposal of PCBs, or are conducting research and development involving PCBs.	http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/data.htm	

Table 2. General PCB Sources		
General Source	**Description**	**Related Databases (reference Table 1, above)**
Items intentionally containing PCBs	Transformers, capacitors, hydraulic and heat transfer fluids	EPA Transformer Registration and PCB Activity Databases
Industry	Steel manufacturing, power plants, electric lamps, plastic materials and resins, motors, carbon and graphite products, wiring devices, communication equipment, rubber, aluminum foundries	TRI, NPL, EPA Transformer Registration and PCB Activity Databases
Combustion of PCB-laden materials	Incinerators of municipal, medical, and hazardous wastes; sewage sludge, scrap tires, industrial and utility boilers	TRI
Environmental sinks	Contaminated sediments	NPL
Inadvertent generation of PCBs	--Combination of carbon, chlorine, and high temperatures can result in PCB generation --Up to 200 chemical processes may create PCB byproducts --Products inadvertently containing PCBs include paint, inks, ag chemicals, plastics, detergent bars	
Storage and disposal facilities	Storage facilities, wastewater treatment plants, incinerators, landfills, decontamination facilities, hazardous waste sites (old products include dust control agents, adhesives, construction materials, gaskets, sound deafening felt)	TRI, NPL, EPA Transformer Registration and PCB Activity Databases
Ohio River Total Maximum Daily Load (TMDL) for PCBs, September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.		

Exhibit L

Related Topics: Corrective Action Sites around the Nation
<https://epa.gov/hwcorrectiveactionsites>

CONTACT US <https://epa.gov/hwcorrectiveactionsites/forms/contact-us-about-corrective-action-sites-around-nation>

Hazardous Waste Cleanup: Chemours Repauno in Gibbstown, New Jersey

Site Facts

EPA ID: NJD002373819
Location: 200 North Repauno Ave, Gibbstown, New Jersey 08027

Property Area: 1,900 acres

Other Names: DuPont Company, General Chemical, L.L.C.

Cleanup Status: Corrective Action Underway
Human Exposure under Control:

Yes, Controlled <https://epa.gov/sites/production/files/2017-08/documents/dup_r725.pdf> (28 pp, 97 K, About PDF <https://epa.gov/home/pdf-files>)

Groundwater under Control:

Yes, Controlled <https://epa.gov/sites/production/files/2017-08/documents/dup_r750.pdf> (32 pp, 77 K, About PDF <https://epa.gov/home/pdf-files>)

Last Updated: February 2015

On this page:

- Cleanup Status
- Site Description
- Contaminants at this Facility
- Site Responsibility

Cleanup Status

In 1990, 8,500 tons of sediments were removed from the ditches in the former Nitrobenzene and Pyromellitic Dianhydride/Dimetyl Terephthalate (PDMT/DMT) production areas. In the three rounds of site wide investigation completed in 1993, 1996, and 2000 respectively, DuPont screened all Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) for their investigation/remediation priorities and focused on the migration/flow of groundwater and the soils in former production areas.

The currently ongoing fourth round of investigation is to complete the investigation of the remaining two solid waste management units and areas of concern (SWMUs/AOCs) to conduct an ecological risk assessment for the wetlands, streams, and the ditch system. In 1985, DuPont installed a system to pump contaminated groundwater and to treat. The groundwater interceptor system has been in operation since, in conjunction with a groundwater monitoring program.

DuPont will continue the fourth round of investigation. Any other source areas of contamination will be identified and cleaned up. The New Jersey Department of Environmental Protection (NJDEP) will issue a deed notice to restrict any uses of the property that may be a threat to people. DuPont will also continue the groundwater interceptor system together with the site wide groundwater monitoring program to confirm that contaminated groundwater is under control. NJDEP also imposes restrictions on the use of groundwater for as long as it remains contaminated.

Additional Site Information

- Contacts for this cleanup <https://epa.gov/hwcorrectiveactionsites/new-jersey-rcra-cleanup-facilities-contacts>

- Reports and Documents <https://epa.gov/hwcorrectiveactionsites/documents-chemours-repauno-gibbstown-new-jersey>
- More Information from the Envirofacts database

Site Description

Chemours Repauno, a former DuPont Company, is located at 200 North Repauno Avenue in Gibbstown, New Jersey. The DuPont Gibbstown plant occupies nearly 1,900 acres along the Delaware River in Gibbstown, Greenwich Township. The plant, which opened in 1880, made a range of products including dynamite, acids, nitrobenzene and other organic compounds. In 1998 and 1999, DuPont sold its remaining business operations (sodium nitrite and industrial diamonds), but retained ownership of the property. On February 1, 2015 Chemours FC, L.L.C. became a new site's owner.

Contaminants at this Facility

Stormwater and wastewaters generated throughout the site have been discharged to the Delaware River through the discharge pipes (point sources) pursuant to the State of New Jersey Pollutant Discharge Elimination System (NJPDES) program. Ditches have been utilized to convey stormwater and wastewaters. Sediments in the ditches and soils at the site are contaminated with nitrobenzene, aniline, diphenylamine, and polychlorinated biphenyls (PCBs). Groundwater is also contaminated with organic compounds, such as nitrobenzene, aniline, benzene, and tetrachloroethylene. The wastewater ditches at the former Nitrobenzene and Pyromellitic Dianhydride/Dimetyl Terephthalate (PDMT/DMT) production areas are a primary source of the contamination.

Site Responsibility at this Facility

Resource Conservation and Recovery Act (RCRA) Corrective Action activities at this facility have been conducted under the direction of EPA Region 2.

Contact Us <https://epa.gov/hwcorrectiveactionsites/forms/contact-us-about-corrective-action-sites-around-nation> to ask a question, provide feedback, or report a problem.

Discover.

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EPA www Web Snapshot <https://epa.gov/utilities/wwwepagov-snapshots>

Grants <https://epa.gov/grants>

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LAST UPDATED ON APRIL 14, 2021

Exhibit M

DOCKET NO. D-2017-009-1

DELAWARE RIVER BASIN COMMISSION

Delaware River Partners LLC
Gibbstown Logistics Center
<u>Greenwich Township, Gloucester County, New Jersey</u>

PROCEEDINGS

This docket is issued in response to an application submitted to the Delaware River Basin Commission (DRBC or "Commission") by Ramboll Environ on behalf of Delaware River Partners LLC (DRP or "docket holder") on August 8, 2017 requesting approval of a Delaware River dredging and deep-water berth construction project for the proposed DRP Gibbstown Logistics Center, a multi-use marine terminal and international logistics center to be located at the former Repauno property (also known formerly as the Chemours Repauno industrial site and DuPont Repauno Works) in Greenwich Township, Gloucester County, New Jersey. The New Jersey Department of Environmental Protection (NJDEP) on April 10, 2017 issued Permit No. 0807-16-0001.1, which included approval of a Waterfront Development Individual Permit (Upland and In-Water), a Flood Hazard Area (FHA) Individual Permit, and a Coastal Wetlands Individual Permit. NJDEP revised this permit on August 3, 2017. DRP's application for a United States Army Corps of Engineers (USACE) Section 10/404 Individual Permit (Application No. CENAP-OP-R-2016-0181) is pending. The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) issued comments on the project in a letter dated May 5, 2017, which were addressed by the docket holder in a response letter dated September 18, 2017. The NMFS review is pending.

The application was reviewed for approval under Section 3.8 of the *Delaware River Basin Compact*. The Gloucester County Planning Board was notified of the application and draft docket. A duly noticed public hearing on this project was held by the DRBC on November 15, 2017.

A. DESCRIPTION

1. **<u>Purpose</u>**. The purpose of this docket is to approve a Delaware River dredging and deep-water berth construction project for the proposed DRP Gibbstown Logistics Center, a multi-use marine terminal and international logistics center. The project involves dredging 371,000 cubic yards (cy) of sediment from the Delaware River, to a depth of 40 feet below (-40) mean lower low water (MLLW) to construct the deep-water berth. The project also involves demolition of the existing wharf and bulkhead, along with the construction of a new bulkhead, a new pile-supported wharf structure, and six new stormwater outfall structures.

2. **Location**. The project is located at the former Chemours Repauno industrial site, 200 North Repauno Avenue in Greenwich Township, Gloucester County, New Jersey, also formerly known as DuPont Repauno Works. The project includes dredging and construction of a deep-water berth at River Mile 86.5 in Water Quality Zone 4 of the Delaware River, as follows:

SITE	LATITUDE (N)	LONGITUDE (W)
Proposed Berth Location	39° 50’ 42”	75° 17’ 45”

3. **Project Area**. The docket holder proposes to develop the Repauno site in Gibbstown, Gloucester County, New Jersey with the new DRP Gibbstown Logistics Center, a multi-use marine terminal and international logistics center. The project involves redevelopment of a former industrial site into a multi-use, deep-water port and logistics center on a 218-acre portion of the 1630-acre Repauno property. Approximately 371,000 cy of Delaware River sediment located in a 27-acre area will be dredged to construct a deep-water berth and access the Delaware River federal navigation channel. For the purpose of defining the Area Served, DRP’s application is incorporated herein by reference consistent with conditions contained in the DECISION section of this docket.

4. **Physical features**.

a. **Project Description**. The docket holder proposes to construct a new multi-use, deep-water port and logistics center to accommodate a range of ocean-going vessels of a maximum length of 870 feet and maximum draft of 40 feet, and will include a marine terminal for automobile import (roll-on/roll-off), a parking lot for vehicles, processing facilities, perishables handling, non-containerized break bulk cargo handling, bulk-liquids and gases handling, two warehouse buildings, and a stormwater management system and associated infrastructure. The project includes:

Dredging: Approximately 118,000 cy of coarse-grained material (predominantly sand) and 253,000 cy of fine-grained material (predominantly silt), for a total of 371,000 cy of sediment over a 27-acre area will be dredged from the Delaware River in order to achieve a dredging depth of -40 feet MLLW, allowing for one foot of overdraft. The dredging will allow the new marine terminal to access the Delaware River federal navigation channel in the River. Approximately 10.6 acres of the dredging is new dredging, while the remainder is dredging to areas of the Delaware River that have previously been dredged or otherwise modified.

Demolition: Currently, the site features a 450-foot long earthen berm/wharf with a timber pile bulkhead. These existing structures are in a dilapidated state. The project includes removal of the bulkhead and some fill behind the bulkhead, in order to construct the new deep-water berth and associated structures. A floating boom will be installed in the Delaware River to secure floating debris during the demolition.

Wharf/Berth Structure Construction: The new berth will extend approximately 100 feet upriver and 200 feet downriver from the existing 450-foot long earthen berm/wharf, for a total length of approximately 750 feet. A steel sheet pile wall will be constructed on the land side of the existing bulkhead. The new wharf structure will be a steel pile-supported, continuous open deck concrete platform connected to the earthen berm and steel sheet pile. The proposed platform is 750 feet long and 140 feet wide at its widest dimension, and will require installation of 382 steel piles (296 30-inch diameter steel piles, 43 36-inch diameter steel piles, and 43 24-inch diameter steel piles). At the location of the existing 450-foot long earthen berm/steel sheet pile that extends into the River, the platform's width will be 93 feet. The platform will extend 200 feet downriver from the existing berm and 100 feet upriver from the existing berm. At these downriver and upriver extensions, the platform's width will be 140 feet. Additional structures to be constructed include a breasting dolphin and two mooring dolphins, to be located upriver and attached to the concrete platform by new steel walkways.

Stormwater Outfalls: The docket holder proposes six new stormwater outfalls into the Delaware River, three of which are upriver of the proposed berth, three of which are downstream of the proposed berth. The outfalls will be located at 4 proposed headwalls.

The docket holder submitted detailed site plans for the project work to be performed at the deep-water berth, including the existing wharf and bulkhead demolition, dredging operations, and deep-water berth construction (new bulkhead and pile-supported wharf structure). The docket holder is required to submit detailed site plans to the DRBC for the remainder of the Logistics Center, including the proposed: automobile import area / parking lot; processing facilities; perishables, bulk-liquids and gases, and bulk cargo handling areas; warehouses and associated buildings; stormwater management system (including stormwater outfalls); and associated infrastructure (See Condition C.I.c.).

b. **Related Dockets**. The former Dupont Repauno Works industrial facility included an industrial process wastewater treatment system, approved by DRBC Docket No. D-1973-150-1 on February 26, 1975, which was transferred to the Chemours Company on June 26, 2015. DRBC Docket No. D-1965-075-1, approved on September 13, 1965, approved the construction of an underground cavern for the storage of anhydrous ammonia at the former Dupont Repauno Works, which was transferred to the docket holder on September 27, 2016 via letter from the DRBC Executive Director. The industrial operations, wastewater treatment facility, and storage of anhydrous ammonia at the Repauno site have been discontinued, and currently Chemours operates a groundwater remediation withdrawal and treatment system on-site for remediation of the former industrial site operations. The project proposes to develop a portion of the existing Repauno site with the new deep-water port and marine terminal and logistics center, which includes utilizing the underground cavern for liquified petroleum gas (LPG) storage, as approved by the Executive Director's September 27, 2016 letter. The docket holder indicated that potable water supply for the project/facility will be provided by groundwater wells owned and operated by Greenwich Township in accordance with DRBC Docket No. D-1994-051 CP-2, issued on July 20, 2005. Sewage generated at the site will be directed to the Greenwich Township WWTP, which was approved by DRBC Docket No. D-1990-024 CP on January 16, 1991.

e. **Cost**. The total cost of the DRP Gibbstown Logistics Center is estimated to be $57,188,106.00.

B. FINDINGS

The docket holder submitted an Application for approval of a Delaware River dredging and deep-water berth construction project associated with the proposed DRP Gibbstown Logistics Center. The project involves dredging 371,000 cy of material from the Delaware River and demolition of the existing wharf and bulkhead, along with the construction of a new bulkhead, a pile-supported wharf structure, and six new stormwater outfall structures.

Dredging

Of the 371,000 cy of dredge material, approximately 118,000 cy is coarse-grained (sand) and the remaining 253,000 is fine grained (silt). The fine-grained sediment will be mechanically dredged using a closed clamshell environmental bucket utilizing best management practices (BMPs) to control turbidity. Dredged material would be placed in water tight barges (hopper barges), which will be transported to a dewatering station, where the material will be allowed to settle.

An estimated 72,000 cy of the fine-grained sediment is classified as “impacted” by NJDEP standards. This sediment is contaminated with polycyclic aromatic hydrocarbons (PAHs), certain metals (primarily arsenic), and polychlorinated biphenyls (PCBs) at concentrations exceeding New Jersey's Residential Direct Contact Soil Remediation Standards. The impacted material is required to be removed and disposed of at an uplands landfill or brownfield site. Impacted dredged material, after dewatering, will be amended by the addition of Portland Cement, which reacts with the sediment slurry to bind sediment particles together and effectively reduce its water content, improving the material’s handling and compaction characteristics, as well as reducing the leaching potential of bound contaminants. This will enable transportation by truck and to meet receiving landfill or brownfield site acceptance criteria.

The remaining 181,000 cy of fine-grained sediment is non-impacted (by NJDEP standards), and is proposed to be transported to one of two confined disposal facilities (CDFs) – Whites Basin CDF and Fort Mifflin CDF – if approved for acceptance. The Whites Basin CDF is located along the southeast shore of the Delaware River between the mouths of Repaupo and Raccoon Creeks, on the north side of the Commodore Barry Bridge in Logan Township, Gloucester County, New Jersey, approximately 3.5 miles downriver of the site. The Fort Mifflin CDF is a USACE-operated CDF located across the River on the former Hog Island at the confluence of the Schuylkill and Delaware Rivers in Philadelphia, Pennsylvania, approximately 6 miles across and upriver of the site. The dewatered material will be transported by barge and pumped from the barge into the CDF handling basins.

Once the fine-grained sediment is removed, the underlying non-impacted coarse-grained sediment will be removed via a hydraulic dredger or hard-digging bucket dredger. Sandy material dredged utilizing the hydraulic dredger will be conveyed via a submerged pipeline to the Whites Basin CDF. Sandy material dredged utilizing the hard digging bucket will be placed in a hopper barge, transferred to a decanting barge, upon which decant water will return to the waterway. Dewatered sand will be transferred via barge to a CDF or to the adjacent upland project site for reuse as fill.

Dewatering of dredged material (including all fine-grained and coarse-grained sediment) in the hopper barges will be conducted with the objective of minimizing the addition of total suspended solids (TSS), turbidity, or sheens to the Delaware River. The main method of dewatering is to pump water from the hopper barges to decant barges. Decant water from the barges will be held for at least 24 hours, and will be discharged back to the River (via a submerged pipe to minimize turbidity) only if the TSS concentration is less than 30 mg/l as required by NJDEP. Similarly, DRBC Water Quality Regulations (WQR), Section 3.10 Basinwide Surface Water Quality Standards, include the requirement that discharges to surface water not exceed 30 mg/l TSS as a 30-day average (WQR Section 3.10.4.D.1.a.). With impacted and non-impacted dredged material alike, TSS is typically used to assess water quality impacts because organic contaminants tend to bind to sediment particles. Dewatering operations will be performed to avoid re-suspending or pumping previously settled sediment.

Delaware River PCB Total Maximum Daily Load (TMDL)

In 2003, the US EPA Regions II and III established the Stage 1 TMDLs for Zone 2 through 5 of the Delaware Estuary for PCBs. The former DuPont Repauno facility was then identified as one of the largest PCB point sources to the Delaware Estuary. Furthermore, a review of the proposed dredging area adjacent to the shoreline exhibits detectable concentrations of PCBs ranging from < 1ppm to 11 ppm, suggesting that the site may have previously contributed to PCB contamination in the tidal river. Further evidence of a soil based source was provided by DuPont in its 2005 initial Pollution Minimization Plan (PMP) report which indicates soil PCB concentrations ranging into the hundreds of ppm in the area to be redeveloped. A PCB PMP was developed and implemented by DuPont, and then later Chemours, for the Repauno site, including the area to be redeveloped by DRP, which was required by Section 4.30.9 of Commission's Water Quality Regulations. Since the 2005 PMP, under the oversight of NJDEP, Chemours has substantially remediated the site, including removing or capping soil and sediment impacted by PCBs. Based on the characterization of on-site soils, characterization of PCBs in adjacent river sediments was not required by NJDEP.

Chemours will continue to monitor outfalls associated with its ongoing remediation of site groundwater pursuant to the requirements of the NJDEP and the DRBC. In connection with the redevelopment of the site, DRP will cap the site with clean fill to raise the site to the necessary elevation. The docket holder is required to apply for and obtain a New Jersey Pollutant Discharge Elimination System (NJPDES) permit from the NJDEP for discharges associated with the site redevelopment. In accordance with the NJPDES permit when issued, the docket holder will be required to perform an investigation of the site to assess the disposition of stormwater and the flow paths for individual stormwater outfalls either directly or indirectly to the Delaware River in order to develop a PCB stormwater sampling plan. Upon evaluation of the sampling results by the NJDEP in consultation with the DRBC, DRP may be required to develop and implement a separate PMP for PCBs (Condition C.I.l.) to ensure that PCB load reductions achieved by DuPont and Chemours are maintained or enhanced by the planned re-development.

Permits

The NJDEP issued Waterfront Development Permit No. 0807-16-0001.1 for approval of a Waterfront Development Individual Permit (IP) Upland, a Waterfront Development IP In-Water, a Flood Hazard Area (FHA) IP, a FHA Verification; a Coastal Wetlands IP, and a Water Quality Certification on April 4, 2017 for the proposed project that included approval of the dredging of no more than 460,000 cy of sediment over an area of 29 acres in the Delaware River, to a water depth of -40 MLLW plus one foot overdraft.

The docket holder submitted a revised application to the NJDEP on December 9, 2016, that shifted the location of the proposed wharf structure (open deck concrete platform and bulkhead) 50 feet channelward towards the Federal Navigation Channel, which resulted in the reduction of the dredging from 457,000 cy in 29 acres to 371,000 cy in 27 acres. On August 3, 2017, NJDEP issued revised Permit No. 0807-16-0001.1 reflecting the revised dredging/wharf location, along with Permit No. 0807-16-0001.2 FWW160001/2 approving a Freshwater Wetlands IP and Transition Area Waiver for Redevelopment.

Along with the proposed project, the NJDEP Waterfront Development Permit included approval of: the permanent disturbance of 3.036 acres and temporary disturbance of 0.261 acres to vegetated riparian zone; the permanent disturbance of 0.186 acres and temporary disturbance of 0.076 acres to mapped coastal wetlands; the permanent disturbance of 1.4 acres of intertidal and subtidal shallows; and the permanent disturbance of 0.064 acres of submerged aquatic vegetation (SAV) that is located in the proposed dredging area. Mitigation for the SAV disturbance is required by the Permit, and consists of transplanting the 0.064 acres of SAV to a location approximately 1,900 feet downriver of the proposed dredging site. Along with other dredging requirements, the Waterfront Development Permit also prohibits in-water work or sediment generating disturbances from March 15 through June 30 of each year, to minimize impacts to migrating and spawning of anadromous fish (See Condition C.I.e).

NJDEP Permit No. 0807-16-0001.2 (including Freshwater Wetlands Individual Permit Nos. FWW160001 and FWW160002) approved the permanent disturbance of 4.441 acres of freshwater wetlands, state open waters, and transition area for the proposed project, and the temporary disturbance of 1.062 acres for the construction of the Marine Terminal on the land side of the project. The areas to be disturbed are upland from the proposed wharf on the project site, and are not directly connected to the Delaware River.

The USACE issued its Jurisdictional Determination No. CENAP-OP-R-2016-0181-1 (JD) for the proposed project on July 5, 2016. DRP's application for a USACE Section 10/404 Individual Permit (Application No. CENAP-OP-R-2016-0181) is pending. In accordance with the Endangered Species Act, the USACE must consult with the National Oceanic and Atmospheric Administration – National Marine Fisheries Service (NMFS) prior to issuing DRP an individual permit under Section 10 of the National Rivers and Harbors Act and Section 404 of the Clean Water Act.

By letter dated May 5, 2017, NMFS provided DRP with comments on the Project, which included comments from the Habitat Conservation Division (HCD) and Protected Resource Division (PRD) of NMFS. The NMFS letter expressed concern that the project may result in unacceptable impacts to aquatic resources under the jurisdiction of NMFS and suggested that options to avoid, minimize and offset these effects be evaluated further. By letter dated September 18, 2017, the docket holder addressed all the NMFS comments, in part by re-locating and redesigning the berth/wharf structure (shifting of the proposed wharf structure 50 feet channelward) to reduce the Project's impact on aquatic resources. As stated above, the revised wharf design was approved by the NJDEP, and is currently under review by the USACE in consultation with NMFS.

The following table (TABLE B-1) lists the application submittal dates and status for the NJDEP Waterfront Development Permit, the USACE Individual Permit, and other local, state and federal permits for the proposed project:

TABLE B-1: Project Permits

PERMIT TYPE/NUMBER	APPLICATION SUBMISSION DATE	STATUS/ ISSUANCE DATE
NJDEP Freshwater Wetlands Letter of Interpretation No. 0807-16-001.1 FWW 160001	2/16/16 (revised 5/27/16)	7/11/16
NJDEP Waterfront Development IP (Upland); Waterfront Development IP (In-Water); FHA Individual Permit; FHA Verification; Coastal Wetlands Individual Permit No. 0807-16-0001.1	8/1/16 (Revised 12/9/16)	4/10/17 (Revised 8/3/17)
NJDEP Freshwater Wetlands Individual Permit; Transition Area Waiver for Redevelopment; Water Quality Certificate No. 0807-16-0001.2	8/1/16 (Revised 12/9/16)	06/30/17 (Revised 8/3/17)
NJDEP Tidelands License (Dredging) No. 0807-16-0001.1	12/9/16	9/28/17
NJDEP Tidelands License (Fixed Structure) No. 0807-16-0001.1	12/9/16	9/28/17
USACE Jurisdictional Determination CENAP-OP-R-2016-0181-1 (JD)	2/18/16	7/5/16
USACE Section 10/404 Individual Permit CENAP-OP-R-2016-0181	8/18/16 (Revised 1/6/17 & 5/17/17)	Pending
Greenwich Township Site Plan Approval (for wharf only)	9/8/17	10/2/17
NJDEP NJPDES permit	Pending	Pending

The project is designed to be in compliance with discharge requirements as set forth in the WQR of the DRBC.

C. DECISION

I. Effective on the approval date for Docket No. D-2017-009-1 below, the project and the appurtenant facilities described in the Section A "Physical Features" of this docket are approved pursuant to Section 3.8 of the *Compact*, subject to the following conditions:

a. The facility shall be operated at all times to comply with the requirements of the WQR of the DRBC.

b. Nothing herein shall be construed to exempt the docket holder from obtaining all necessary permits and/or approvals from other state, federal or local government agencies having jurisdiction over this project.

c. The docket holder is required to submit detailed project site plans to the DRBC for the remainder of the work not submitted with the DRBC application, including the proposed: automobile import area / parking lot; processing facilities; perishables, bulk-liquid, and bulk cargo handling areas; warehouses and associated buildings; stormwater management system (including stormwater outfalls); and associated infrastructure.

d. To minimize impacts to migrating and spawning of anadromous fish, any and all in-water work or sediment generating disturbances are prohibited from March 15 to June 30 of each year.

e. Sound practices of excavation, backfill and reseeding shall be followed to minimize erosion and deposition of sediment in streams.

f. Within 10 days of the date that construction of the project has started, the docket holder shall notify the DRBC of the starting date and scheduled completion date.

g. Upon completion of construction of the approved project, the docket holder shall submit a statement to the DRBC, signed by the docket holder's engineer or other responsible agent, advising the Commission that the construction has been completed in compliance with the approved plans, giving the final construction cost of the approved project and the date the project is placed into operation.

h. This docket approval shall expire three years from date below unless prior thereto the docket holder has commenced operation of the subject project or has expended substantial funds (in relation to the cost of the project) in reliance upon this docket approval.

i. The issuance of this docket approval shall not create any private or proprietary rights in the waters of the Basin, and the Commission reserves the right to amend, suspend or rescind the docket for cause, to ensure proper control, use and management of the water resources of the Basin.

j. The Executive Director may modify or suspend this approval or any condition thereof, or require mitigating measures pending additional review, if in the Executive Director's judgment such modification or suspension is required to protect the water resources of the Basin.

k. If in the view of the Executive Director of the DRBC the dredging operations are at any time being conducted in a manner contrary to the conditions of this approval, or such that these operations are adversely affecting water quality or impeding the passage of anadromous fish, the Executive Director may direct that these operations be suspended.

l. In accordance with the NJPDES permit when issued, the docket holder shall perform an investigation of the site to assess the disposition of stormwater and the flow paths for individual stormwater outfalls either directly or indirectly to the Delaware River in order to develop and implement a PCB stormwater sampling plan. Upon evaluation of the sampling results by the NJDEP in consultation with the DRBC, DRP may be required to develop and implement a separate PMP for PCBs in accordance with Section 4.30.9 of the Commission's Water Code and Water Quality Regulations (18 CFR Part 410).

m. The docket holder and any other person aggrieved by a reviewable action or decision taken by the Executive Director or Commission pursuant to this docket may seek an administrative hearing pursuant to Articles 5 and 6 of the Commission's *Rules of Practice and Procedure,* and after exhausting all administrative remedies may seek judicial review pursuant to Article 6, section 2.6.10 of the *Rules of Practice and Procedure* (18 CFR 401.90) and section 15.1(p) of the Commission's *Compac*t.

BY THE COMMISSION

DATE APPROVED: December 13, 2017

Exhibit N

MEMORANDUM FOR RECORD

SUBJECT: Department of the Army Environmental Assessment and Statement of Findings for the Above-Referenced Standard Individual Permit Application

This document constitutes the Environmental Assessment, 404(b)(1) Guidelines Evaluation, as applicable, Public Interest Review, and Statement of Findings for the subject application.

1.0 Introduction and Overview: Information about the proposal subject to one or more of the Corps' regulatory authorities is provided in Section 1, detailed evaluation of the activity is found in Sections 2 through 11 and findings are documented in Section 12 of this memorandum. Further, summary information about the activity including administrative history of actions taken during project evaluation is attached (ORM2 Summary) and incorporated in this memorandum.

1.1 Applicant: Delaware River Partners, LLC

1.2 Activity location: Lots 2, 3, 4, 4.01 and 4.02 of Block 8, in the Gibbstown Section of Greenwich Township, Gloucester County, New Jersey

1.3 Description of activity requiring permit:

Activities authorized per Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act of 1899 include the construction of a proposed new marine terminal consisting of two (2) loading platforms, eight (8) breasting dolphins, 11 mooring dolphins, walkways to provide access between the loading platforms and dolphins, a trestle supporting a one-lane vehicular roadway with adjacent pedestrian access and an internal pipe system for the transfer bulk liquid product (including Liquefied Natural Gas (LNG)), and mechanical dredging in the waterway.

Loading Platforms

Two loading platforms, each 138.5' x 85' in size, will be constructed to allow for loading bulk liquid product onto vessels. Each loading platform will be constructed on forty 30" diameter steel pipe piles (80 piles total). The loading platforms will be connected to the trestle by an 88.5' by 45' structure supported by fourteen 24" steel pipe piles. The location of the loading platforms are shown on the attached plan sheets.

Trestle

Access to the loading platforms from land will be provided by a 36’ wide trestle supporting a one-lane vehicular roadway with adjacent pedestrian access, an internal pipe system for the transfer bulk liquid product, and mechanical and electrical support systems. The trestle will extend waterward from the mean high water line for approximately 660’. At that point, the trestle will turn west and run parallel to the loading platforms, dolphins, and walkways for approximately 1611’. The trestle will be supported by 4 pile supported bents, with a total of 210 24” diameter steel wall pipe piles over 50 bents.

These pipelines, which go from the trestle to the loading platforms, will vary in size and contain multiple products, including bulk liquids, water, nitrogen electricity and fire retardant.

A 50’ wide abutment will support the landing of the trestle above the mean high water line. A sheet pile wall will be constructed around the abutment to provide additional structural support (total length 147 feet).

Dolphins

In order to secure the vessels at the site, 11 mooring dolphins (including one shared mooring dolphin) and eight (8) breasting dolphins will be installed. Both the mooring and breasting dolphins will be 33’ square. The shared mooring dolphin will be 57’ by 33’.

The typical mooring dolphin will be constructed on nine 48” diameter steel wall pipe piles. The shared mooring dolphin will be constructed on fifteen 48” diameter steel pipe piles (95 total piles). The breasting dolphins will be constructed on eight 48” diameter steel pipe piles (64 total piles).

Walkways

Walkways will be installed between the loading platforms and dolphins to provide access from the platforms to the dolphins. Eleven 48” steel pipe piles will be installed to support all 1640 linear feet of the 5’ wide walkways. Walkways between loading platforms, mooring dolphins, and breasting dolphins will be provided with four intermediate support systems.

The overall length of the structure, including the mooring dolphins, will be 2550 linear feet. The waterward most structure will be located approximately 650’ from the edge of the Federal Navigation Channel. Lighting fixtures on the structures will be installed as required by the US Coast Guard.

Mechanical Dredging

An area approximately 45 acres in size will be dredged to a depth of -43 feet mean lower low water ± 1 foot overdraft. The material, composed primarily of a silt and clay, will be removed using mechanical excavation equipment. A closed environmental mechanical bucket will be used primarily to excavate the silt layer from the waterway. The bucket will remain closed over the water while the majority of the water drains from the excavated material. The dredged material will then be placed in a hopper barge and allowed to decant, with the excess water returning to the waterway. Sediment testing confirms that the material meets the New Jersey Department of Environmental Protection's requirements with regard to contaminant levels. One option would be for the material to be taken directly to the Whites Basin Confined Disposal Facility (CDF) located in Logan Township, Gloucester County, New Jersey. A second option will be to load the material onto a barge and transported to the Fort Mifflin CDF, located in the City of Philadelphia, Philadelphia County, Pennsylvania. A separate permit will need to be obtained from the US Army Corps of Engineers, Operation Division before any material will be accepted at the Fort Mifflin CDF. For material destined for the Whites Basin facility, the dredged material will be placed directly into bottom-dump barges. These barges will then be transported by tugboat to the Whites Basin and discharged into the Basin in accordance with their operating permits. For material approved by the Corps for the Ft. Mifflin site, the dredged material will be mechanically dredged and placed directly into hopper barges. The hopper scows will then be transported by tugboat across the channel to a hydraulic unloader positioned on a spud barge located adjacent to the Ft. Mifflin CDF site. There, the material will be hydraulically unloaded from the hopper scows directly into one of the upland CDF cells at Ft. Mifflin. A total of approximately 665,000 cubic yards of material will be removed from the waterway. It is also noted that some of the materials dredged from the Delaware River may be used as fill for the development activities on the site.

Equipment to be used at the site for the proposed construction activities described herein will be located no closer than 50 feet from the edge of the Federal navigation channel. Remnants of an existing structure constructed approximately 100 years ago will remain in place and not be impacted by the work proposed at the site.

Due to concerns raised in response to the April 4, 2019 Public Notice, this office issued a Supplemental PN, dated July 16, 2019. The following additional information was provided to promote a greater understanding of project activities and clarity of the overall proposed project:

- Liquefied Natural Gas (LNG) will not be processed or stored on the project site. This product will arrive at the proposed structure via truck or tanker railcar. Approximately 15 trucks per hour would enter the site, 24/7. Each truck would carry approximately 12,000 gallons of product. Once on site, the LNG would be pumped directly from the traveling vehicle to a waiting LNG vessel(s). The approximate ship loading time is 2 weeks. Once full, the vessel(s) will leave the site and a new ship will arrive.
- Gloucester County is proposing to construct a new access road to the marine terminal. The new road will divert the existing commercial traffic from Route 44 to the marine terminal, allowing the trucks to bypass residential areas in Gibbstown. Gloucester County has proposed the construction of this dedicated road as a means to limit traffic impacts associated with port activities on the community. The proposed access road will not require any approvals from the Corps of Engineers but is being evaluated due to the single and complete/reasonably related nature of this component. The road will be built by the County and is not being proposed by the applicant.
- The applicant has estimated that the proposed operations at the site will generate approximately 15 trucks in and out of the facility per hour on average. The use of railcars for the transportation of LNG was approved by the US Department of Transportation in December 2019. The applicant have not indicated to this office how many tankers would be sent to the project site. The U.S. Pipeline and Hazardous Materials Safety Administration, under the US Department of Transportation, oversees transport of bulk liquid products on US rails.
- All loading/unloading operations will take place a minimum of 1 mile from the residential center of the Township. The proposed access road will be located approximately 110 feet from the nearest residents of the Township and is separated from these areas by an active railroad right-of-way.

1.3.1 Proposed avoidance and minimization measures: Shallow draft vessels will be used to minimize sediment generation to the existing substrate during the construction phase. Piles will be driven using ½ power starts and a bubble curtain being deployed to minimize impacts to aquatic resources located adjacent to the project site. All safety measures as required by law will be installed/followed to reduce potential impacts to the surrounding environment from the bulk liquid products.

1.3.2 Proposed compensatory mitigation: No formal compensatory mitigation will be required since no SAV will be directly disturbed, nor are any Federally regulated wetlands being impacted by the project. The applicant has offered to compensate, at a 1:1 ratio, the SAV that may be impacted by shading from the trestle (0.01 acres). An area of SAV was directly impacted by Dock 1, and compensatory mitigation was required for the approximately 0.1 acre directly impacted. The permittee will add to the mitigation site previously approved by this office to compensate for the Dock 2 SAV impacts. A full monitoring report, associated with the previous approved dock, has been developed and was made a requirement of the previous Corps permit. NOAA Habitat Conservation Division has reviewed and approved the SAV plan.

1.4 Existing conditions and any applicable project history: The site was previously used as a marine terminal; remnant piles from a previously existing structure are present at the site. No serviceable structures have been located at the section of the property where Dock 2 is proposed to be located since the 1980s. Upland portions of the site have been unused for significant period of time.

1.5 Permit Authority: Section 10 of the Rivers and Harbors Act (33 USC 403) and Section 404 of the Clean Water Act (33 USC 1344).

2.0 Scope of review for National Environmental Policy Act (i.e. scope of analysis), Section 7 of the Endangered Species Act (i.e. action area), and Section 106 of the National Historic Preservation Act (i.e. permit area)

2.1 Determination of scope of analysis for National Environmental Policy Act (NEPA):

The scope of analysis includes the specific activity requiring a Department of the Army permit. Other portions of the entire project are included because the Corps does have sufficient control and responsibility to warrant federal review.

Final description of scope of analysis: The scope of analysis will include the in-water work for the dredging and construction of the dock. Additionally, the pipeline leading from the dock to the truck/train car that contains the bulk liquid products to be off-loaded will be included in the scope of analysis for this action. While not under the jurisdiction of this office, the COE is considering potential impacts from the truck traffic that would be using the proposed access road.

2.2 Determination of the “Corps action area” for Section 7 of the Endangered Species Act (ESA): The Corps action area will include sections of the river to be used by the vessels to gain access to the marine terminal, the site where the dredging will take place, the location of the marine terminal, the locations where the excavated material will be disposed and the sections of the site where the petroleum and other bulk liquids will be transferred from the truck/train car to the ocean going vessel.

2.3 Determination of permit area for Section 106 of the National Historic Preservation Act (NHPA):

The permit area includes those areas comprising waters of the United States that will be directly affected by the proposed work or structures , as well as activities outside of waters of the U.S. because all three tests identified in 33 CFR 325, Appendix C(g)(1) have been met.

Final description of the permit area: The area in the waterway to be dredged, the location of the dock, and the upland area that will be used to place trucks/train cars that will supply bulk liquid products to the vessels. The upland area is being included since there would be no need for the dredging and docking structure, but/for the trucks/train cars bring the products to the site, it is integral to the regulated activities, and directly associated with the water operations.

3.0 Purpose and Need

3.1 Purpose and need for the project as provided by the applicant and reviewed by the Corps: The applicant's stated purpose is to redevelop a site and create a deep water marine terminal that can accommodate two (2) bulk liquid vessels simultaneously. The applicant stated that the market has shifted from what was presented during the permit review for Dock 1 at the site. There is now a higher need for vessels carrying bulk liquid products, which could not be economically accommodated at Dock 1. Each vessel that would carry LNG would be a maximum length of 966 feet, a beam width of 155, with a maximum of a 42 foot draft.

3.2 Basic project purpose, as determined by the Corps: The purpose is to establish a marine terminal at which multiple types of bulk liquids, including LNG and other petroleum products, can be transferred from trucks/train cars to vessels for transport.

3.3 Water dependency determination: The activity does require access or proximity to or siting within a special aquatic site to fulfill its basic purpose. Therefore, the activity is water dependent. SAV may be impacted by the shading of the trestle going over the upstream limit of an expanding bed. The dock structure must be located in the water to accommodate vessels that will take the petroleum and bulk liquid products from the site to other locations in the US and around the world.

3.4 Overall project purpose, as determined by the Corps: The project purpose is to establish a marine terminal that can accommodate two (2) vessels, up to 173,400 cubic meters in capacity, for the transfer of bulk liquid products (including petroleum products), from trucks or train cars for shipment to processing plants within the US and around the world.

4.0 Coordination

4.1 The results of coordinating the proposal on Public Notice (PN) are identified below, including a summary of issues raised, any applicant response and the Corps' evaluation of concerns.

Were comments received in response to the PN? Yes NOTE: Comments were received for both the initial PN (April 4, 2019) and the supplemental PN (July 16, 2019). Below is a summary of all comments received to both PNs.

Were comments forwarded to the applicant for response? Yes, all comments were forwarded to the applicant for review. The applicant supplied formal responses to the concerns raised in response to the PNs.

Was a public meeting and/or hearing requested and, if so, was one conducted? No, no public hearing or meeting was requested. It should be noted that the Delaware River Basin Commission (DRBC) did hold a public hearing to discuss the issues associated with this project on June 6, 2019. The Corps was in attendance at that meeting. The comments expressed by the concerned citizens below were presented to the DRBC.

Comments received in response to public notice:

Comment 1:

National Marine Fisheries Service (NMFS) Protected Resource Division - In a letter dated April 11, 2019, NMFS requested an additional 30 days to comment on the Corps Public Notice. In a letter dated April 17, 2019, this office extended the comment period for NMFS an additional 30 days. In a letter dated May 30, 2019, NMFS stated that due to 1) the additional dredging proposed for Dock 2 and 2) that dredging would occur in June - September when eggs and larvae may be in the area, that re-initiation of coordination and modification of the Biological Opinion (BiOp), developed during the review for the permit application for Dock 1 was required. After significant coordination between all parties, the applicant decided not to perform in-water work between July 1 and September 15. Based on previous discussions with the NMFS, with the inclusion of a seasonal restriction from March 15 through September 15 (which would address concerns of the Habitat Conservation Division, see below), this office determined on September 24, 2019 that the project is "Not Likely to Adversely Affect" (NLTAA) the sturgeon species at the site, or the Atlantic Sturgeon critical habitat. This office submitted a modified Biological Assessment to the NMFS for review. NMFS "…generally concurred…" with the Corps determination that the project was not likely to adversely affect the 2 sturgeon species, and Atlantic Sturgeon critical habitat in a letter dated November 19, 2019. They "…offered several clarifications for the record…." where they had concerns with the COE determination. However, these concerns did not affect the NMFS concurring with the Corps final determination with respect to the sturgeon species.. For additional information concerning the NMFS comments, see the above referenced letter

Applicant's Response: After issuance of the first Public Notice, the applicant was informed that if they chose not to perform in-water work between July 1 and September 15, the determination of NLTAA could be made for the project. The applicant stated that they wanted to be able to dredge during this time period. As such, the Corps processed the action as a formal consultation with NMFS and was going to make an Adverse Effect determination. The applicant presented supplemental information as several requests came from NMFS. These questions came from NMFS in response to the Corps' revised Biological Assessment. The applicant stated they would institute best management practices (BMP) to minimize impacts to the sturgeon and critical habitat at the site. They also supplied updated vessels traffic calculations, sound levels that would be generated and revised construction details. In a phone message left on September 20, 2019, the applicant changed their position with respect to dredging in the waterway. They stated that they would not perform any in-water work at the project site between July 1 and September 15 to protect sturgeon larvae that may be in the project area.

Corps Evaluation: It is the determination of this office that with the inclusion of special conditions including no in-water work between July 1 and September 15, the project may effect, but is not likely to adversely affect the 2 sturgeon species known to inhabit the project site and the Atlantic Sturgeon's critical habitat that is present in this section of the river.

Comment 2: National Marine Fisheries Service (NMFS) Habitat Conservation Division – In an e-mail sent May 13, 2019, the NMFS Habitat Conservation expressed concerns with respect to the access trestle and shading of SAV habitat in the area. In a letter dated May 30, 2019, NMFS Habitat Conservation stated that Essential Fish Habitat (EFH) is not located within the main stem of the Delaware River (not at the project site), however, species protected by Magnuson Stevens Fishery Conservation and Management Act do inhabit the project site. They requested a seasonal restriction from March 15 through June 30 to insure impacts to anadromous species using the area of the project will be minimal.

Applicant's Response: A previous survey of the site did not find SAV in the area where the trestle would be located. The trestle was placed in this location so as to not impact any SAV. Delaware River Partners (DRP) presented a representation of the shadow field that would occur from the trestle. In a letter dated July 16, 2019, DRP presented to this office a 2019 survey performed that found additional SAV near and under the trestle site. It was determined that some SAV plants had migrated from an existing SAV bed (approximately 0.01 acre in size) to the trestle site. The applicant stated that moving the trestle would impact more SAV plants and presented a proposal to relocate the plants from the location of the trestle to the area of the SAV mitigation site for Dock 1 (located approximately 500 upstream of the trestle). NMFS Habitat Conservation stated that the proposal was acceptable and requested that the area under the dock be monitored to observe the effects of the shading on SAV. DRP requested that the Corps approve the transplant work so the work could be performed in early August, during the growing season.

Corps Evaluation: This office will add the seasonal restriction as requested by NMFS Habitat Conservation. Since the size of the impact to SAV is less than 0.1 acre, this office will not make the compensatory mitigation a permit condition. However, this office informed DRP that they could perform the transplantation of the SAV plants in August. This office stressed that this work would be done at DRP own risk and would not influence the Corps' final determination with respect to the proposed second dock.

Comment 9: United States Environmental Protection Agency (USEPA) had the following comments:

In an e-mail sent August 15, 2019, the USEPA, Region 3 (This region has been performing SAV surveys in the Delaware River) is supportive of post construction monitoring of SAV within the mitigation site and under the pier structure, if vegetation is left in place. USEPA, Region 3 is interested in the monitoring reports when they become available. USEPA Region 3 coordinated this reply with USEPA, Region 2 office, and they concur with this determination with respect to SAV.

In a letter dated August 19, 2019, the USEPA, Region 2 (Lead Region for New Jersey) sent a letter to this office with the following comments:

- The project is within the Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE non-attainment are for the ozone National Ambient Air Quality Standards. Recommended that this office prepare a General Conformity Applicability Analysis.
- The Gloucester County by-pass road has not been placed on the Transportation Improvement Program for New Jersey. A discussion of

funding and timetable for the road should have been in the Supplemental Public Notice

- The Department of Energy would need to be involved in the project if the LNG were to be transported to certain Caribbean Countries.
- The site is located within a FEMA delineated flood zone. The applicant needs to discuss measures to minimize potential impacts from flooding.
- FERC and/or the Pipeline and Hazardous Materials Safety Administration of the DOT calculates thermal radiation protection exclusion zones. USEPA Region 2 asked if this had been done for the project site.

Applicant's Response: The applicant supplied the SAV plan that was reviewed by the USEPA, Region 3. USEPA, Region 2 asked for a copy of the planting report and future SAV reports for the project. With respect to USEPA, Region 2, the applicant generated a General Conformity Applicability Analysis which was provided to the Corps. Emission estimates for each of the required source categories were developed using an approximate timeline for construction, equipment-specific utilization rates, and material transport considerations. Total estimated emissions of VOCs were calculated at 0.62 tpy in 2019 and 1.43 tpy in 2020. Total NOx emissions are 19.61 tpy in 2019 and 25.75 tpy in 2020. Therefore, construction related emissions are well below the de minimis level for a marginal ozone non-attainment area and a General Conformity determination is not required. The road project is separate from the marine terminal. The County is responsible for placing the project on the Transportation Improvement Program (TIP) for New Jersey. A public hearing was held to discuss the road on July 8th to discuss any local issues with the road. FERC does not have jurisdiction over the proposed project. As required, a permit will be sought for the export of LNG. The New Jersey Department of Environmental Protection issued a Flood Hazard Area Control Act Permit for work on the entire property on April 10, 2017. Even though this project is not an LNG facility under FERC jurisdiction, a thermal radiation protection exclusion zone will be prepared as part of DRP's compliance with New Jersey's Toxic Catastrophe Prevention Act.

Corps Evaluation: While not a permit condition for this action, this office will monitor the SAV mitigation site as required in the permit for Dock 1. Future reports will be sent to USEPA, Region 3. As stated above, the applicant did a General Conformity Applicability Analysis for Dock 2, including the potential impacts of the trucks that would be using the proposed access road to transport the bulk liquid products to the site. The results showed only a minimal increase in greenhouse gases that would result from construction of the project. Gloucester County held a public hearing for the by-pass road. and, whether or not it was placed on the Transportation Improvement Program is not germane to this office. The existence of the Route 44 Bypass is a condition of the permit for the transportation of bulk petroleum products to the site, and the impacts of construction of the Route 44 Bypass were considered during the Corps' review of the permit application. The applicant is responsible for obtaining all state and Federal permits and approvals as required by law. The NJDEP issued a Flood Hazard Permit for the work at the site.

Comment 4: Delaware Riverkeeper[1] - Several comment letters/e-mails were sent by the Riverkeeper expressing concerns about the project. Concerns raised in a letter to this office on June 14, 2019 expressed the following:

- The Corps failed to comply with NEPA by not performing an EIS;
- The Corps did not fully expose all relevant information concerning the project;
- The Corps did not fully discuss direct impacts to the local community, both positive and negative;
- The project had been segmented (i.e. permit issued for Dock 1 and a second application received by this office for Dock 2);
- Potential impacts of the project if an accident occurred during transporting LNG and petroleum products.

In response to the Corps' Supplemental Public Notice the Delaware Riverkeeper, in a letter dated July 31, 2019 expressed the following concerns:

- The Corps must finalize their analysis of all potential impacts of the project;
- The Corps must consider impacts of both Dock 1 and Dock 2 during the review for this action;
- The Corps must evaluate the impacts to water quality;
- Project's ability to comply with CZM and other state regulations must be evaluated;
- The negative impacts from the expansion of tanker terminals, proposed dock increases the number of vessels using the area;
- The storage of crude oil, gases and other potentially hazardous liquids prevents dangers that need to be addressed;
- Changes in construction and operation plans at the site are yet to be factored into the applicant's numerous permit applications;
- Impacts to the surrounding environment;
- Impacts to Marine Fish and Fisheries;
- Stormwater management must be evaluated;

[1] Corps responses to all public concerns can be found at the end of this section.

- Project does not meet new dredging requirements under NJ State law;
- Corps must ensure Public Interest Review accounts for all threats to Fish and Wildlife;
- Threats to finfish migratory pathways;
- Project threatens SAV habitat;
- Project will impact Endangered and Threatened wildlife or plant species habitat;
- Project impact state and Federal protected critical wildlife habitats;
- Special hazards must be evaluated to protect public safety;
- Impact local historic cultural scenic and recreational values;
- Impacts to archeological resources;
- Ensure adequate floodplain management;
- Account for projects environmental, health and safety impacts;
- NEPA mandates the Corps must do an EIS;
- NEPA review must include impacts associated with climate change;
- Impacts to handling all proposed products at the site;
- Risks of increase of trucking and traffic;
- Potential for leaks at the site;
- Discuss potential accidents at the site from trucking and loading cargo;
- Impacts on surface and ground waters;
- Threat of release of PCB from site;
- Impacts from the dredging must be evaluated;
- Impacts from increased vessel traffic;
- Impacts of ballast water;
- Impacts to air quality;
- Impacts to sturgeon;
- Threats to freshwater mussels;
- Impacts to wildlife during construction and during operations at the site;
- Public Need for the project
- Illegal segmentation of the project.

Applicant's Response: The applicant states that no permit application has been denied by the NJDEP and that the site is not a liquefied natural gas facility as defined by the NJDEP. The applicant states that due to a shift in the market, a demand for a bulk liquid product necessitated the additional structure for the site. Only 89 new vessels per year will use the entire facility (i.e. both dock structures), as opposed to 91 that was stated in the permit application for Dock 1. Some of the vessels using the site will have previously using other port facilities on the Delaware River. Applicant states other state/Federal agencies have regulations with respect to the vessels in port and on the river (USCG), terminal safety (NJ Toxic Catastrophe Prevention Act/Bureau of Release Prevention) road and rail safety (DOT/Federal Motor Carrier Safety

Administration/Pipeline and Hazardous Materials Safety Administration). All these regulations must be complied with before the products would reach the facility. An impact assessment with respect to aquatic species was performed and supplied with the application. The applicant also states that the Corps is in consultation with NOAA (both Habitat Conservation and Protected Resources) with respect to aquatic resources. Remediation activities that are located in uplands are being conducted by the previous owner (Chemours) as required under the Pollutant Minimization Plan prepared in 2005 and approved by the NJDEP. During the dredging at Dock 1, the applicant removed accumulated sediment that had been contaminated. The material to be excavated at Dock 2 has been fully characterized in accordance with NJDEP regulations, and contaminants were either undetected or detected at concentration that do not exceed NJDEP remediation standards. As required by NJDEP, the Corps and the Delaware River Basin Commission, BMP will be employed when removing the sediment from the waterway. The applicant has been working with the Corps, NMFS and NJDEP with respect to potential impacts to SAV as a result of the project. The site is subject to the NJDEP Flood Hazard Area Control Act and a permit was issued for the site in 2017. With respect to historic resources, a Phase I survey was performed in the water in 2018, and submitted to the Corps as part of the Dock 2 application. While targets were found during the study, none of these targets were considered a potential submerged cultural resource. A Phase IA survey was performed for the on-shore locations for archeological resources in 2016. The site was given a low potential to yield significant Native American archaeological remains. The site is not a National Landmark, National Rivers, National Wilderness area, National Seashore, National Recreation Area, National Lakeshores, National Park or National Monument location. The site is not in the section of the Delaware River that is considered Wild and Scenic. The applicant owns approximately 1600 acres, the developed portion of the property covers approximately 200 acres. The development has been designed to avoid wetland areas on the property. The applicant states that Dock 2 is "functionally independent" from Dock 1. The two docks will handle different types of vessels and operate independently. The applicant states that the issuance of a permit for Dock 1 did not limit options for a second dock at the site. The applicant states that "changes in the market conditions after issuance of the permits for Dock 1 led to consideration for a second dock." The applicant states that "…comments opposing fossil fuel use and climate change raise a number of issues that are being debated at the state, Federal and international levels, and that encompass activities and decisions that go well beyond the scope of DRP's proposed project, and beyond the scope of the PCOE's (Philadelphia Corps of Engineers, added by project manager) required review of the project impacts." The site has been designed to minimize the impact of truck traffic on the surrounding roadways. The County is going to construct an access road and has received funding for the construction of the road. A public hearing concerning the road was held on July 8, 2019. The applicant states the bypass will mitigate the impacts of the trucks using the facility.

Comment 5: As of August 30, 2019, 345 form e-mails have been received by this office from private citizens expressing the following concerns

- The hazards of transporting LNG on public roads near local residents and a day care center and on the public roads in Pennsylvania and New Jersey. Fires could result that are not extinguishable;
- The hazards of trans-loading the LNG from trucks onto ships 24/7. The number transfer operation greatly increase the likelihood of accidents at the site. The release of vapor can cause impacts to residents around the facility. Impact area from a situation could be greater than 1 square mile;
- Increase the vessel traffic in the area of the project; increase potential for a vessel explosion due to increase in the number of ships;
- Impacts to aquatic resources due to the dredging in the river, including the 2 sturgeon species that are listed under ESA;
- Unknown details of the proposed Route 44 bypass road to be constructed; these details include when construction would commence and funding for road;
- Current contamination on the site should be mitigated for prior to any additional work at the site;
- Air pollution that would occur from the site.

Applicant's Response: The applicant states that the materials to be transported are no different than materials currently traveling public highways. The proposed Route 44 by-pass will mitigate for impacts to the local roads, with the trucks being no closer than ½ mile from the public school. The school and daycare center are located near a plot of land where a conservation easement has been placed. DRP has obtained approval from the NJDEP Bureau of Release Prevention for the storage of butane at the site and will obtain all state and Federal permits as required by law for operations at the site (including the Toxic Catastrophe Prevention Act). Additionally, USCG regulates the operations with respect to the ships that will be used at the site. DRP further states that the number of new vessels that will be using the site will not have a significant impact on shipping in the river. Impacts to aquatic resources are being addressed by the appropriate state/Federal agencies during the permit review. The County advertised the proposed Route 44 by-pass in May of 2018. On July 8, 2019, a public information meeting was held concerning the proposed road. DRP further states the road will mitigate impacts to local residents and passed on information provided to DRP by the

County, "substantial completion of the bypass will occur no later than August 1, 2020, which is at least 6 months prior to the anticipated commencement of the proposed truck transportation operation". DRP states the site is not a listed Superfund site. Remediation work is being conducted by the previous owner and any construction will be coordinated with the NJDEP to ensure that it does not impact the remediation on-going at the site. Finally, all permits with regard to air quality will be obtained and air quality provisions will not be violated.

Comment 6: Sierra Club – The Sierra Club expressed the following concerns:

- Critical information has come to light that needs a full environmental review;
- Project could led to spills and explosions from the delivery and trans-loading of LNG at the site;
- Dredging of 45 acres in the waterway will cause impacts due to the sediment being contaminated by previously existing site operations;
- Impacts of the on-shore development will impact the river, including the 2 sturgeon species;
- Potential impacts to residents surrounding the site due to potential accidents;
- Potential impacts to water supplies;
- Potential impacts of truck traffic (1400/day) within the Delaware Valley and the danger these trucks could have on the local population and environment;
- Greenhouse gases that would be generated by the use of the LNG;
- Potential impacts of these ships impacting other vessels in the area like the Athos matter;
- Disruption of vessel and road traffic in order to insure safe passages of vessels transporting LNG on vessels;
- Increased fracking in the region;

Applicant's Response: Impacts and operations of the proposed facility have been available to the public for an extended period of time. Additionally, in-water sediment has been tested at the site and found to meet state standards for upland disposal. The on-shore contaminated soil and ground water is being removed by previous owner. The applicant has applied to NJDEP for permits which will require the minimization of stormwater generated from the on-shore from contacting surrounding area. The project is being designed to minimize impacts to terrestrial and aquatic organisms during construction and after operations commence at the site. The US Coast Guard is responsible for safe transportation of the vessels from shore until it leaves the navigation channel. The Athos was an unusual event when a vessel struck a large detached anchor in the water. After dredging, no obstructions will be in the waterway between the dock and the Federal navigation channel.

Comment 7: Surfrider Foundation – The Surfrider Foundation had the following comments:

- Requested an EIS be generated due to the potential impacts the project would have on the surrounding environment;
- Concerned with impacts of fossil fuels with respect to climate change;
- Stated the need for a full NEPA review;
- Concerns with the applicant misleading the public with respect LNG being processed on the site;
- Failed to acknowledge link between proposed liquidation plant in PA and the proposed dock facility;
- Environmental impacts including impacts to aquatic resources and impacts from truck traffic. Additionally impacts that will accelerate climate change;
- Impacts to recreational boat user of the Delaware River;
- Safety issues associated with the transfer of LNG from tanker to vessel on the river;
- The site would become a target for terrorists.

Applicant's Response: In the opinion of the applicant, the Corps can perform an EA for the work proposed at the site; the EA would determine if an EIS is warranted in this matter. Additionally, the Corps is not hiding information, the first Public Notice stated that LNG would be present at the site. Potential environmental impacts would be mitigated for with existing laws and regulations. The Delaware River supports both recreational and commercial vessels. The new structure will improve local economy due to new jobs during and after completion of construction. The applicant states that potential impacts with respect to climate change goes beyond the scope of Corps review. Several Federal agencies, including the Department of Transportation and the US Coast Guard, have regulations for the safe transportation of LNG and other petroleum products. State regulations are also in place to minimize potential impacts the subject site would cause the surrounding area.

Comment 8: Township Planning Officer – Mr. J. Timothy Kernan of Maser Engineering had the following comments:

- Asked if the project was subject to a review from the NJDOT Hazmat Security Plan and Compliance and NJDOT Hazmat Shippers Regulations.
- Asked if the decanted water from the hopper barges was to be tested for contaminants.
- Requested additional information concerning the proposed access road (restricted access, fencing along the road, sound-fencing near residences).

Applicant's Response: The applicant stated that the project is not subject to the requirements of the NJDOT and that the applicant would comply with all state and Federal regulations. Further, the applicant stated that testing of the return water was not required by the NJDEP and that sediment testing in the waterway indicated the sediment did not exceed NJDEP remediation standards and can be placed within confined disposal facilities. The applicant continued that all steps would be taken to minimize sediment travel from the site during dredging. The applicant states that the by-pass road is a County project and will meet all state/Federal requirements. The road would be open to the public and that a checkpoint would be established at the entrance of the facility.

Comment 9: Food and Water Watch. Food and Water Watch, a Washington, D.C.-based non-governmental organization which focuses on corporate and government accountability relating to food, water, and corporate overreach, had the following comments:

- Called the project "a capstone project that will facilitate the extraction, leakage and combustion of vast amount of…Greenhouse Gas…";
- Would lock the US and foreign markets into fossil fuel dependency;
- Project requires a full Environmental Impact Statement;
- Impacts of truck traffic impact local communities and regional highways;
- Potential explosion from the trucks that would use the facility;
- Lack of setback for residents along the proposed access road;
- Lack of review by the Corps of the potential impacts from shipping LNG via rail to the site;
- Project will increase the likelihood of oil/gas leaks from excavation of the materials to be shipped from the site;
- Increase in CO2 levels and resulting environmental impacts, including climate change;
- Increase in amount of natural gas obtained via fracking;
- Impacts of fracking on the local environment and potential long term impacts;

- Increase marketability of LNG and potential impacts on the economic markets. Project would also increase domestic price of fossil fuels;
- Impacts on local climate;
- Impacts to the environment including fish, wildlife, loss of habitats like tidal marsh, SAV and wetlands, change in water temperature and over development of the section of the Delaware River;
- Impacts to floodplain habitat due to sea level rise;
- Impacts to water supply intakes from sea level rise;
- Impacts to water quality due to climatic changes from burning of fossil fuels;
- Create a flood of natural gas that would lessen the need for alternative fuel sources.

Applicant's Response: The models of trucks and tankers that will be used are already in use on regional roads/rails. The applicant states that energy needs will increase regardless of whether the dock is built; so impacts directly associated with the fossil fuel would occur whether the dock is built or not. No wetlands will be directly impacted by the project. Impacts associated with fossil fuels on climate change are regulated under different agencies at both the state and Federal level. Direct impacts caused by the dredging and construction and use of the dock will not cause the environmental impacts suggested in the letter. The construction of the dock would not change these regulations. The applicant noted that state and Federal regulations cover the vessels in port, pumping of the petroleum products to the vessels, transporting materials via road and rail. Safety measures are required and the applicant has stated that all requirements will be met at the facility.

Comment 10: Michael Bullard sent an e-mail stating the following:

The country faces an excess of gas and natural gas in Pennsylvania. Stated impacts of fracking on the environment and the low return from taxes from fracking operations.

Applicant's Response: The dock is designed for several types of liquid products, not just gas. Projected growth in domestic production of bulk liquids products is expected to be approximately 20% over the next 5 years.

Comment 11: Carol Jagiello sent an e-mail stating the following:

The potential dangers of the project were not documented. Additionally, environmental impacts of the project, including impacts to roads, noise and air quality from trucks needs to be considered. The project is not being considered for need, but for private profit and that there is no need for this "redundant fossil fuel infrastructure".

Applicant's Response: There are several agencies including USCG and the NJDEP that are responsible for ensuring safety at the project site and on the River. The bypass road will minimize impacts from traffic using the project site. If required, appropriate air permit(s) will be obtained for the installation and operation of equipment related to the operations at the site and required under New Jersey regulations. The Project will be operated in accordance with the provisions of any such permit(s) such that the Project will not cause or contribute to a violation of applicable air quality standards. Emissions from mobile sources (i.e., trucks) are managed by the NJDEP's Bureau of Mobile Sources. Dock 2 was designed to meet growing demand for export of a variety of bulk liquids products. Most of these products are exported from the Gulf Coast region; however, the East Coast is also experiencing significant growth. Projected growth in domestic production of bulk liquids products is expected to be approximately 20% over the next 5 years.

Corps Responses to Concerns Raised by Concerned Citizens

What follows are the Corps responses to the issues raised by the public to the proposed activity described above. The comments and responses have been combined into this section for ease of review.

Corps National Environmental Policy Act (NEPA) Review

The Corps, Philadelphia District has processed this application as mandated in the Department of the Army regulations 33 CFR 320-329. Review under NEPA was done in accordance with 33 CFR Appendix B to Part 325.

The applicant stated that Dock 1 has independent utility and will still be functional regardless of the permit decision rendered by this office regarding Dock 2. The two docks will handle different types of vessels, receive different types of cargo, and operate independently. Vessels calling at Dock 1 will deliver cargo such has automobiles (roll-on/roll-off), non-containerized break bulk cargoes, bulk products, and bulk liquids. Vessels calling at Dock 2 will be delivering bulk liquids, but in larger vessels with greater capacity than the bulk liquid deliveries at Dock 1. Dock 1 is not necessary for Dock 2 to operate and Dock 2 is not necessary for Dock 1 to operate. The applicant states that the issuance of a permit for Dock 1 did not limit options for a second dock at the site. The applicant states that "changes in the market conditions after issuance of the permits for Dock 1 led to consideration for a second dock". This office must accept the information presented by the applicant unless there is clear evidence to the contrary. An alternative analysis was included with the permit application for Dock 2 that looked at several sites in the area for a marine terminal facility, and those sites were considered by the Corps.

After conducting review under NEPA as required by 33 CFR Appendix B to Part 325, this office has made a Finding of No Significant Impact with respect to the overall activities at both docks, at the project site. The FONSI is based on all available information, including the information supplied to this office from all interested parties, including the Federal resource agencies and the general public. The decision document generated for this action serves as the Environmental Assessment for this action. As such, this office has completed its requirements under NEPA and therefore, no Environmental Impact Statement is required. See 33 CFR Appendix B to Part 325, Section 7.

Other State and Federal Regulations

The Corps of Engineers regulates the discharge of dredge fill material into waters of the United States under Section 404 of the Clean Water Act and work within navigable waters under Section 10 of the Rivers and Harbor Act of 1899, as required in the regulations noted above. Other state/Federal agencies have regulations with respect to vessels in port and on the river (USCG), terminal safety (NJ Toxic Catastrophe Prevention Act/Bureau of Release Prevention) road and rail safety (DOT/Federal Motor Carrier Safety Administration/Pipeline and Hazardous Materials Safety Administration). While other potential impacts must be addressed as required by NEPA, the Corps regulations do not usurp other agencies authorities. Concerned citizens have stated numerous potential impacts that would result from the project that are best addressed by other state or Federal agencies that have the technical expertise in these areas. They include the following:

Air quality

The Clean Air Act is administered by the USEPA and state and local governments. The applicant is required to comply with existing regulations concerning emissions and pollutants mandated by other Federal agencies and NJDEP (see N.J.A.C. 7:27). As noted above, the USEPA requested a General Conformity Determination be made by this office in accordance with Section 176 (c) (4) of the Clean Air Act. The applicant prepared the document for the Corps and made a determination that impacts resulting from the project would be de minimis. After review by this office, the Corps concurred with the findings in the General Conformity determination that the development of the marine terminal and the trucks that will access the site will have minimal impacts on air quality around the project site. Impacts during the construction phase will be short term and minimal. An increase of vessel traffic by seven (7) vessels a month in the river (see below) will have minimal impacts on the overall air quality at the site. Truck traffic will increase in the area of the marine terminal. Most of this impact will be mitigated by the creation of the by-pass road. Overall, the Corps determined that the impacts to air quality from the additional activities at the site should be minimal.

Water Quality

On May 20, 2019, the New Jersey Department of Environmental Protection (NJDEP) issued a Waterfront Development Permit, which included a Water Quality Certification and a statement that the project is consistent with the state's Coastal Zone Management Rules. The permit was suspended on June 5, 2019 due to a clerical error by the NJDEP. The permit was reinstated without change by the NJDEP on September 5, 2019.

Concerns regarding water quality include impacts to water quality, impacts on surface and ground waters, impacts of ballast water, and stormwater management are addressed as follows:

No adverse impacts to water quality are expected. The water quality of the Delaware River in the vicinity of the Project Area may be temporarily impacted due to sediment disturbance caused by dredging activities. BMPs will be implemented during construction to reduce sediment resuspension and associated effects on water quality. Potential impacts to water quality associated with dredging and in-water construction will be temporary and limited to a relatively small area of the Delaware River. Following the completion of construction activities, water quality is expected to return to pre-construction conditions. Should we address impacts to water quality by activities after construction?

With regard to ballast water, all operations at Dock 2 will comply with the United States Coast Guard ("USCG") ballast water regulations pertaining to ballast water exchange. 33 C.F.R. 151.1510. The ballast water exchange regulations require international ships to (a) conduct mid-ocean ballast exchanges more than 200 miles off-shore; (2) retain ballast water; or (3) use an approved ballast water management system that meets USCG discharge standards relative to organism content. In addition, the USEPA regulates incidental discharges into waters of the U.S. from commercial vessels greater from commercial vessels of all sizes through the Vessel General Permit program. The Applicant will require that vessels calling at Dock 2 to abide by applicable USCG regulations in order to avoid adverse effects of non-invasive species that should be present in ballast water, and to minimize to every extent possible the intake of larvae and juvenile fish. In particular the Applicant will require that discharge and intake of ballast water while at berth will be limited to the minimum needed to assure vessel stability. Based on these regulations, the majority of all ballast water exchanges for vessels calling on the proposed terminal will occur in off-shore marine waters, where early life stages of anadromous fish are not present. Modern design features, which allow ships to redistribute ballast rather than taking on new water at port, significantly reduce the potential for entrainment of larvae and release of non-indigenous species. In addition, ballast water intake openings are screened to prevent the intake and release of debris and aquatic life.

Floodplain/Stormwater Management

The NJDEP has specific Floodplain Management requirements for all projects located along state waters. These regulations do not include work waterward of mean high water, only for work in upland portions of the property. The NJDEP reviewed and approved the work proposed for the floodplain area, for the entire project site on April 10, 2017. No changes to this determination were made with respect to the additional dock to be added to the site. Stormwater discharges are regulated by NJDEP. See N.J.A.C. 7:8. The applicant has obtained or will obtain applicable NJPDES permits or authorizations for management of stormwater at the marine terminal facility. As of January 2020, the applicant has obtained authorizations under NJDEP General Stormwater Permit for Construction Activity (General Permit 5G3) for the following: 1) construction of facilities for use and operation of existing cavern; 2) construction of Dock 2 and adjacent landside first point of rest area, 3) stockpiling and grading of soil n a portion of the marine terminal footprint, and 4) construction of rail infrastructure within the marine terminal footprint. The construction activities were also authorized by the NJDEP Waterfront Development Permit issues in 2017. The applicant is also intending to submit a Request for Authorization (RFA) under the NJDPES Stormwater Permit for Construction Activities for the minor land disturbance that will be necessary to construct the landing of the Dock 2 trestle within the marine terminal footprint. For stormwater associated with the opertation of the marine terminal, the applicant has submitted an RFA under NJDEP's Basic Industrial Stormwater General Permit 5G2 that is under NJDEP review.

Existing Contamination at the site

The site is not on the list of the USEPA Superfund contamination sites. Work to clean up contaminated material on the property is being performed under the requirements of the NJDEP Site Remediation Program, by the previous property owner. The contaminated material is being monitored and removed from the project site and handled per NJDEP requirements. With regard to dredged material, sediment testing as required by NJDEP regulations was performed on the material to be excavated from the waterway. Over 50 samples were taken from the waterway to a depth of 45 feet ± 2 feet, the depth of the proposed dredging at the site. The material was found to meet the State Residential and/or Non-Residential Soil Remediation Standard. This standard allows for the dredging of the material and placement at the upland disposal facility that is part of the Weeks Marines facility. It is noted that material from the previous dredging for Dock 1 was contaminated. The NJDEP required the applicant to mix the dredged material with pozzolan on a barge located in the water at the dredging site. Once dried, the modified dredged material needed to be disposed of at a NJDEP approved upland site.

Vessel Traffic

The USCG is responsible for safeguarding vessel traffic on the nation's coastal and inland waterways. It should be noted that the USCG has the primary responsibility with respect to potential impacts due to vessel traffic. During the processing of the permit for Dock 1, the applicant stated that 91 new vessels per year (approximately seven (7) per month) will be using the River as a result of the operation of Dock 1. During the processing of the permit application for Dock 2, the applicant stated that the total number of vessels projected to visit Dock 1/Dock 2 combined is reduced to 89 vessels per year. 52 of these vessels would visit Dock 1 and 37 vessels would visit Dock 2. . So the addition of Dock 2 does not increase the total number of new vessels projected to visit the port facility. Based on an e-mail received by this office on February 24, 2020, the U.S. Coast Guard …"has completed our review of the Letter of Intent submitted by Repauno Port and Rail Terminal to operate a multi-use, single berth, deep-water port and logistics center in Gibbstown, NJ. The COTP has determined that the Delaware Bay and River are suitable for an increase in marine traffic carrying Liquefied Petroleum Gas (LPG) and Liquefied Natural Gas (LNG) cargoes…"

Storage and Transportation of Hazardous Materials at the site

The Department of Homeland Security (DHS) and the United States Department of Transportation (USDOT) share responsibility for regulating the safe and secure transportation of hazardous materials, including LNG. The United Sates Coast Guard (USCG) is responsible for overseeing regulatory compliance in the transportation of hazardous materials by water. Regulations for waterfront facilities handling LNG in bulk are contained at 33 CFR Part 127. The USCG is currently reviewing a Letter of Intent submitted by the applicant as required by 33 CFR 127.008 with respect to the proposed transport of the bulk liquid products on the Delaware River. In accordance with 33 CFR 127.009, the USCG will issue a Letter of Recommendation as to the suitability of the waterway for LNG marine traffic based on the numerous factors set forth in that regulation. Further, vessels transferring LNG for use as fuel are regulated in accordance with 46 CFR Subchapter D and, in most cases, Subchapter O. The Pipeline and Hazardous Materials Safety Administration (PHMSA), an administration of USDOT, issued the Hazardous Materials Regulations (HMR) for the safe and secure transportation of hazardous materials by rail car, aircraft, motor vehicle, or vessel. See 49 C.F.R., Subtitle B, Chapter I. In addition to addressing the loading, movement, and unloading of hazardous materials, the HMR also regulates the storage of hazardous materials at a transloading facility. See 49 C.F.R., Subtitle B, Chapter I. The applicant is required as a condition of the Corps permit to comply with to comply with these regulations. The truck carrier will also be required to comply the Federal Motor Carrier Safety Regulations for the transportation or shipment of hazardous material by highway, including obtaining a hazardous material safety permit. See 49 CFR Subtitle B, Chapter III, Part 385, Subpart E. The Corps of Engineers will not substitute its judgment for that of the agencies that have the authority to administer regulations ensuring the safe and secure transportation of hazardous materials, including LNG.

Applicant is also required to comply with any state and local laws and regulations regarding the handling, storage, and release of hazardous materials, including but not limited to the NJ Toxic Catastrophe Prevention Act, NJ ST 13:1K, which is administered by NJDEP. The purpose of the regulations implementing the TCPA is to protect the public from catastrophic accidents from chemical releases of extraordinarily hazardous substances to the environment by anticipating the circumstances that could result in such releases and requiring precautionary and preemptive actions to prevent such releases.

The applicant represented that Federal Energy Regulatory Commission (FERC) does not have jurisdiction since Dock 2 is not an “LNG Terminal.” This office contacted FERC to confirm, and was informed that DRP’s interpretation that Dock 2 is not an LNG Terminal was reasonable.

Fish and Wildlife

Terrestrial Resources

As required by the ESA, Fish and Wildlife Coordination Act, Bald and Golden Eagle Protect Act this office coordinated with the US Fish and Wildlife Service

(USFWS) concerning potential impacts to resources under its review. No objections were received from the USFWS to the issuance of a permit for Dock 2 by this office. Red Knots (Calidris canutus) are a migratory bird species that generally uses beaches and mudflats along the Atlantic Coast of New Jersey for stopover areas and is not expected to be present in the Project Area. The project manager for this action performs site inspections to determine whether potential Bog Turtle (Glyptemys muhlenbergii) habitat is present at a project site. Based on previous site inspections, it was the determination of the project manager that no potential bog turtle habitat is present at the project site. It should be noted that approximately 1000 acres of upland and wetland habitat will remain on the site after construction and during operations of the marine terminal. While Bald Eagles (Haliaeetus leucocephalus) are protected by the Bald and Golden Eagle Protection Act (BGEPA), they are no longer considered a Threatened Species under the ESA. Based on all available information, the project will not “take” a bald eagle during construction or after operations commence at the site. Therefore, the project will be in compliance with (BGEPA). Osprey (Pandion haliaetus) may use the trees on the undeveloped sections of the site and possibly nest in these areas. Sufficient habitat away from the terminal operation exists for any osprey to use during their life cycles. Additionally, the NJDEP has required as part of their permit a 1000 foot buffer from any active Osprey nest between April and October.

Aquatic Resources

During the permit review for Dock Number 1, this office made a determination that the proposed project would not have an adverse effect on T&E species under the review of the NMFS. During a phone conversation with the NMFS, Protected Resource Division, it was determined that the project had the potential of having an adverse effect on Atlantic Sturgeon (Acipenser oxyrhynchus oxyrhynchus), its’ critical habitat, and Shortnose Sturgeon (Acipenser brevirostrum). In response to the Public Notice for Dock 1, the NMFS in a letter dated May 5, 2017, expressed its concerns that the project would have an adverse effect on T&E species in the area of the project. Based on this letter, a formal consultation under the protocol of the Endangered Species Act (ESA) was conducted and a Biological Assessment (BA) was developed to document the potential impacts of the project on the resources of concern. Based on several correspondences with the NMFS, including a meeting held at the NMFS’s regional headquarters in Gloucester MA, a BA was sent to the NMFS in a letter dated August 11, 2017. In a letter dated August 26, 2017, the BA was accepted by the NMFS and a formal consultation under the ESA was commenced. In an e-mail sent November 15, 2017, the NMFS requested additional information with respect to the use of shipping lanes located outside the Corps determined action area. In a letter dated December 8, 2017, the Service sent to this office the Biological Opinion (BiOp) which outlined the Service's position with respect to the ESA as applied to Dock 1.

In the BiOp the Service states:

"After reviewing the best available information on the status of endangered and threatened species under our jurisdiction, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is our biological opinion that the proposed action may adversely affect but is not likely to jeopardize the continued existence of shortnose sturgeon, or the Gulf of Maine, New York Bight, Chesapeake Bay, and South Atlantic Distinct Population Segments of Atlantic sturgeon. We find that the proposed action is not likely to adversely affect critical habitat designated for the New York Bight DPS of Atlantic sturgeon, or the Carolina DPS of Atlantic sturgeon, or North Atlantic green, Northwest Atlantic Ocean DPS loggerhead, Kemps Ridley sea turtles; or the North Atlantic right whale and fin whales."

For the Dock 2 action, this office re-coordinated with NMFS with respect to the 2 sturgeon species, and the critical habitat for Atlantic Sturgeon. As discussed during the Dock 1 project, ship strikes are the NMFS primary concern with respect to sturgeon deaths in the Delaware River. The applicant has stated that 89 new vessels per year (approximately seven (7) vessels per month) will be using the Delaware River as a result of the all construction activities at the site. The NMFS indicated in the Biological Opinion that this increase the number of vessels will not be significant. No additional vessel traffic will use the waterway than the 89 vessels discussed during the permit review for Dock 1.

In a letter dated May 30, 2019, NMFS stated that due to the increased dredging proposed at the site beyond that proposed for Dock 1, and that the timing of the dredging would occur in July – September, when eggs and larvae of Atlantic Sturgeon may be in the area, that re-initiation of coordination and modification of the Biological Opinion developed during the review of the permit application for Dock 1 was required. After significant coordination between all parties, the applicant decided not to perform in-water work between July 1 and September 15. Based on previous discussions with the NMFS, with the inclusion of a seasonal restriction from March 15 through September 15, this office determined on September 24, 2019, that the project is "Not Likely to Adversely Affect" the sturgeon species at the site, or the Atlantic Sturgeon critical habitat. This office submitted a modified Biological Assessment to the NMFS for review. NMFS "…generally concurred…" with the Corps determination that the project was not likely to adversely affect the 2 sturgeon species, and Atlantic Sturgeon critical habitat in a letter dated November 19, 2019. No freshwater mussels are known to exist in the area of the dredging.

In a letter dated May 30, 2019, NMFS stated that Essential Fish Habitat (EFH) is not located within the main stem of the Delaware River (not at the project site), however, species protected by Magnuson Stevens Fishery Conservation and Management Act do inhabit the project site. They requested a seasonal restriction from March 15 through June 30 to insure impacts to anadromous species using the area of the project will be minimal. This seasonal restriction been made into a permit condition and added to the Corps permit.

Submerged Aquatic Vegetation (SAV)

SAV is a vital resource for many organisms located within the river. The dock location and design were predicated to avoid SAV located within the waterway. However, a small area of SAV developed after the permit application was received by this office. An area of SAV < 0.1 acre will be shaded by the proposed structure. There is the potential that a pile would be driven into the SAV, but this will not be determined until construction begins. Since the size of the impact to SAV is less than 0.1 acre, this office will not make the compensatory mitigation a requirement of the permit. This office will continue to monitor the SAV habitat created for the direct impacts to SAV that resulted during the construction of Dock 1.

Historic and Archeological Resources

With respect to historic resources, a Phase I survey was performed in the water in 2018, and submitted to the Corps as part of the Dock 2 application. While targets were found during the study, none of these targets were considered a potential submerged cultural resource. A Phase IA survey was performed for the on-shore locations for archeological resources in 2016. The site was given a low potential to yield significant Native American archaeological remains. The site is not a National Landmark, National Rivers, National Wilderness area, National Seashore, National Recreation Area, National Lakeshores, National Park or National Monument location. The site is not in the section of the Delaware River that is considered Wild and Scenic. The District’s Cultural Resource Specialist determined that there were no cultural or archeological resources of importance that would be affected within the Corps’ permit area.

Additional discussion of submitted comments, applicant response and/or Corps' evaluation: N/A

4.2 Were additional issues raised by the Corps including any as a result of coordination with other Corps offices? Yes Operation Division stated in an e-mail sent April 30, 2019, the project would have no issues with respect to the navigation channel.

4.3 Were comments raised that do not require further discussion because they address activities and/or effects outside of the Corps' purview? Yes

If yes, provide discussion: Comments were submitted regarding increased fracking in the region, greenhouse gases that would be generated by use of LNG, impacts of the continued use of fossil fuels (including an increase in CO2 levels with respect to climate change), a link between the proposed dock and the proposed liquidated plant in Pennsylvania, and the possibility of a terrorist attack due to the presence of LNG. There is not a reasonably close enough causal relationship between issuance of the permit for Dock 2 and these potential effects to require consideration under NEPA.

5.0 Alternatives Analysis (33 CFR Part 325 Appendix B(7), 40 CFR 230.5(c) and 40 CFR 1502.14). An evaluation of alternatives is required under NEPA for all jurisdictional activities. An evaluation of alternatives is required under the Section 404(b) (1) Guidelines for projects that include the discharge of dredged or fill material. NEPA requires discussion of a reasonable range of alternatives, including the no action alternative, and the effects of those alternatives; under the Guidelines, practicability of alternatives is taken into consideration and no alternative may be permitted if there is a less environmentally damaging practicable alternative.

5.1 Site selection/screening criteria: In order to be practicable, an alternative must be available, achieve the overall project purpose (as defined by the Corps), and be feasible when considering cost, logistics and existing technology.

Criteria for evaluating alternatives as evaluated and determined by the Corps: Areas in and around the Greenwich Township, along the Delaware River. The current DRP site already has many of the facilities required for this operation (future County by-pass, underground storage, rail access, etc.) that make it the initially preferred alternative (IPA). This office also considered a reduction of the size of the in-water work (i.e. dredging and structural work) at the location of the applicant's IPA.

5.2 Description of alternatives

5.2.1 The no action alternative would preclude the applicant from developing a marine terminal to help meet the expanding marketplace for LNG and other bulk liquid products here in the US and around the world. Dock 1 can't handle liquid energy products nearly as efficiently as the proposed Dock 2 and as such should not be considered as part of the "no action" alternative.

5.2.2

The applicant prepared an Alternatives Analysis that identified and analyzed nine (9) alternative sites for the construction of Dock 2. The portion of the Delaware River adjacent to each alternative site analyzed is designated critical habitat for Atlantic sturgeon, an adult migration corridor for Adult Atlantic and shortnose sturgeon, and an overwintering and foraging area for juveniles of both species. Therefore, impacts to Atlantic and shortnose sturgeon would be the same at any of the alternative sites. Other information regarding the nine (9) alternative sites is set forth below:

- Existing South Jersey Port Corporation facilities, NJ

  The Port of Camden is an existing terminal facility located in a heavily populated urban area within the City of Camden. Much of the infrastructure needed to operate a marine terminal already exists at the site and opportunities may exist to increase terminal capacity. Additionally, the Port of Camden is rated well in terms of meeting local planning guidelines and avoiding environmental impacts due to its existing infrastructure. However, the Port of Camden is currently at its development limits and directly abuts Camden's Waterfront South neighborhood community. There is no land or additional wharf space available to expand beyond the current borders of the Port of Camden. Aging waterfront infrastructure will require significant reconstruction to handle additional vessel calls or larger ships. the existing berths cannot be deepened below 35 feet MLLW without strengthening. The Port of Camden does not support or have the capabilities necessary for operations related to handling bulk liquids.

- DuPont property in Carneys Point, Salem County, NJ

  Since this site has no usable pier structure, extensive overwater construction would be necessary. Additionally, 3,000,000 cubic yards of dredging could be needed. To construct a useable pier, some portion of the Delaware River would require bulkheading and backfill. Significant environmental impacts/disturbances from amount of dredging and waterfront development.

- Ferro Industrial Site in Logan Township, Gloucester County, NJ

  The Ferro Industrial site is a 175-acre undeveloped parcel located along the Delaware River between Oldmans Creek and the Logan Generating Station. The site suffers from a lack of rail access and existing pier structures. Developing a connection to existing rail would likely require impacts to mapped freshwater wetlands. Since this site has no usable pier structure, extensive overwater construction (including bulkheading and backfilling a portion of the Delaware River) would be necessary. Additionally, approximately 2,000,000 cubic yards of material would need to be dredged.

- Raccoon Island Site in Logan Township, Gloucester County, NJ

  The Raccoon Island site is a 520-acre parcel located along the Delaware River at the outlet of Raccoon Creek in Logan Township, Gloucester County. The site is undeveloped and consists predominantly of agricultural fields and wetlands. Over 30% of the site is mapped as freshwater wetlands, including approximately 10 acres of forested wetlands. The site contains over 200 acres of contiguous forest and has been identified as potential habitat for the federally-endangered northern long-eared bat. It lacks nearby rail and suitable roadway access and has no usable pier structure.

- Former BP Oil Terminal Site in Paulsboro, Gloucester County, NJ

  The Paulsboro Marine Terminal located in Paulsboro, New Jersey, will be a multi-use general cargo terminal with heavy-lift capabilities. The 190-acre site is located along the Delaware River directly across from the Philadelphia International Airport. This facility has no capabilities for handling bulk liquids. It is unlikely that existing or planned facilities could be converted to fulfill project purpose without displacing other uses.

- Southport Brownfield Development Area in Gloucester City, Camden County, NJ

  The Southport Brownfield Development Area is a 145-acre site located on the Delaware River in Gloucester City. The site is being subdivided into parcels as ongoing environmental cleanup and remediation is complete. Currently, construction of a food waste recycling plant is underway. The site has no usuable pier structure and is not well positioned relative to road and rail access.

- Penn Terminal site in Eddystone, Delaware County, Pennsylvania

The Penn Terminal site, located just north of Chester, PA, was originally used for shipbuilding. It is a previously disturbed area with minimal wetland and forested areas on site. In 1986, 80 acres of the original shipyard facility was converted to a multi-purpose marine terminal. The terminal is already dedicated to existing customers with limited capacity to accommodate additional cargos. Due to the relatively high rock formations in this part of the Delaware River, deepening the channel may require rock blasting, resulting in a different and more severe impact to sturgeon that vessel strikes.

- Southport Marine Terminal Complex in Philadelphia, Philadelphia County, PA

  The Southport Marine Terminal Complex consists of three (3) sites: (1) the 120-acre Southport Marine Terminal; (2) the 75-acre Southport West Terminal; and (3) Pier 134 North Berth. The three sites are controlled by PhilaPort, who was seeking to partner with a private developer to develop the site. In 2016, the Commonwealth of Pennsylvania committed $93 million in investment to expand operations at the site. In addition to developing facilities to handle roll-on/roll-off cargo, one of the primary goals is the development of an automated container terminal. There are no plans to develop any of the Southport sites as bulk liquid terminals.

5.2.3

On-site alternative 1 (applicant's preferred alternative): Working in an area that has been disturbed previously. There is a need for adequate space from the existing dock structure to the proposed structure for the marine terminal to function properly. Also need upland space to handle cargo to be delivered to the vessel. Much of the roads need for the project were already in place prior to the construction of Dock 1. The DRP Gibbstown Logistics Center is situated on 1,630 acres along the Delaware River in Gibbstown, NJ. The majority of the area being redeveloped was historically disturbed for industrial operations, has lain dormant as a brownfields site for several years, and is deed restricted for industrial use. Only 600,000 – 800,000 cy of dredging. Other impacts (to sturgeon) similar to other sites. All wetland impacts resulting from the project are in Assumed Waters and thereby regulated by the NJDEP. All permits required by the NJDEP for wetland impacts have been issued.

5.3 Evaluate alternatives and whether or not each is practicable under the Guidelines or reasonable under NEPA – During the review for Dock 1, the applicant provided this office with several location that were considered before selection the current location. This office accepted that the current site was the best location for a marine terminal, in the region, along the Delaware River. The applicant's proposed site location will have a least disturbance to the aquatic environment

- Existing South Jersey Port Corporation facilities, NJ

  The SJPC terminals in Camden were eliminated from consideration as a practicable alternative due to their constrained land area and current commodity use that is not compatible with proposed commodities.

- DuPont Chamber Works site in Carneys Point, Salem County, NJ

  Conceptually, this site is suitable for the project purposes. It has rail access and connections to the interstate highway system. Since this site has no usable pier structure, extensive overwater construction would be necessary. Further, a relatively large volume of dredging (approximately 3,000,000 cubic yards) would be required for adequate berthing.

- Ferro Industrial Site in Logan Township, Gloucester County, NJ

  The Ferro Industrial site consists of only 175 acres. Development necessary for the project purpose is further constrained by the presence of pipelines, wetlands, and the habitat restoration program. For these reasons, this site is not a practicable alternative.

- Raccoon Island Site in Logan Township, Gloucester County, NJ

  Conceptually, this site is suitable for the project purposes. Since this site has no usable pier structure, extensive overwater construction would be necessary. Establishing a connection to mainline rail would likely result in impacts to the wetlands surrounding the site. Additionally, 3,000,000 cubic yards of dredging could be needed.

- Former BP Oil Terminal Site in Paulsboro, Gloucester County, NJ

  This facility has no capabilities for handling bulk liquids. It is unlikely that existing or planned facilities could be converted to fulfill project purpose without displacing other uses. For these reasons, this site is not a practicable alternative.

- Southport Brownfield Development Area in Gloucester City, Camden County, NJ

The site has no usable pier structure and is not well positioned relative to road and rail access. There are not enough uplands for infrastructure necessary for project purposes. For these reasons, this site is not a practicable alternative.

- Penn Terminal site in Eddystone, Delaware County, Pennsylvania

  The terminal is already dedicated to existing customers with limited capacity to accommodate additional cargos. For these reasons, this site is not a practicable alternative.

- Southport Marine Terminal Complex in Philadelphia, Philadelphia County, PA

  In addition to developing facilities to handle roll-on/roll-off cargo, one of the primary goals is the development of an automated container terminal. There are no plans to develop any of the Southport sites as bulk liquid terminals. For these reasons, this site is not a practicable alternative.

Table Alternative Site Comparison

	No Action Alternative	SJPC Camden Terminals	DuPont Carneys Point	Ferro Industrial Site	Raccoon Island	Paulsboro Marine Terminal	DRP Gibbstown Logistics Center	Southport Brownfield	Penn Terminal	Southport Marine Terminal
Environmental Impacts	No Impact	2 – Low Impact	4 – High Impact	5 – Highest Impact	5 – Highest Impact	3 – Low to Medium Impact	2-3 Low to Medium Impact	4 – High Impact	3 – Medium Impact	3 – Medium Impact
Project Purpose	Not Met	Not Suitable	Suitable	Not Suitable	Suitable	Not Suitable	Suitable	Not Suitable	Not Suitable	Not Suitable
Logistics	N/A	Not Favorable	Not Favorable	Not Favorable	Not Favorable	Favorable	Favorable	Not Favorable	Not Favorable	Not Favorable
Cost	N/A	Moderate Cost	Moderate Cost	Highest Cost	Highest Cost	Lowest Cost	Moderate Cost	High Cost	Moderate Cost	Moderate Cost
Technology and Infrastructure	N/A	Required	May be Required	May be Required	Not Required	Not Required	Not Required	May be Required	Required	May be Required

5.4 Least environmentally damaging practicable alternative under the 404(b)(1) Guidelines (if applicable) and the environmentally preferable alternative under NEPA:

There are three sites that are practicable for the project purposes: DuPont Carneys Point, Raccoon Island, and the preferred alternative. Constructing the project at either DuPont Carneys Point or Raccoon Island will result in greater impact to the aquatic environment that the preferred alternative. The DuPont Carneys Point site has no usable pier structure, and therefore extensive overwater construction would be necessary. Further, a relatively large volume of dredging (approximately 3,000,000 cubic yards) would be required for adequate berthing. The Raccoon Island site has similar requirements and impacts as the DuPont Carneys Point site. Additionally, development of rail access would likely result in impacts to wetlands, as 30% of the site is mapped freshwater wetlands. In contract, constructing the dock at the preferred alternative will require only 600,000 – 800,000 cubic yards of material to be dredged and has a usable pier structure. There will be minimal impacts to wetlands. The portion of the Delaware River adjacent to all three sites is designated critical habitat for Atlantic sturgeon, an adult migration corridor for Adult Atlantic and shortnose sturgeon, and an overwintering and foraging area for juveniles of both species. Therefore, impacts to Atlantic and shortnose sturgeon would be the same at any of the three sites. The applicant's preferred alternative is the alternative that minimizes the impacts to the aquatic environment to the maximum extent practicable.

6.0 Evaluation for Compliance with the Section 404(b)(1) Guidelines. The following sequence of evaluation is consistent with 40 CFR 230.5

6.1 Practicable alternatives to the proposed discharge consistent with 40 CFR 230.5(c) are evaluated in Section 5. The statements below summarize the analysis of alternatives.

In summary, based on the analysis in Section 5.0 above, the no-action alternative, which would not involve discharge into waters, is not practicable.

It has been determined that there are no alternatives to the proposed discharge that would be less environmentally damaging. (Subpart B, 40 CFR 230.10(a)). The proposed discharge in this evaluation is the practicable alternative with the least adverse impact on the aquatic ecosystem, and it does not have other significant environmental consequences.

6.2 Candidate disposal site delineation (Subpart B, 40 CFR 230.11(f)). Each disposal site shall be specified through the application of these Guidelines:

Discussion: Both proposed sites, Whites Basin and the Corps' Fort Mifflin are active disposal sites. Work at Whites Basin has been approved by the Regulatory Branch (CENAP-OP-R-2013-0696). Operation Division oversees the disposal of dredged material into the Fort Mifflin site.

6.3 Potential impacts on physical and chemical characteristics of the aquatic ecosystem (Subpart C 40 CFR 230.20). See Table 1:

Table 1 – Potential Impacts on Physical and Chemical Characteristics

Physical and Chemical Characteristics	N/A	No Effect	Negligible Effect	Minor Effect (Short Term)	Minor Effect (Long Term)	Major Effect
Substrate				X		
Suspended particulates/ turbidity				X		
Water				X		
Current patterns and water circulation				X		
Normal water fluctuations		X				
Salinity gradients		X				

Discussion: During the dredging, suspended material will impact the waterway. Upon completing of work, the sediment levels will return to preconstruction conditions. Vessels docked at the facility may cause some re-suspension of sediment while at the dock. Impacts resulting from the vessels at the dock should be minimal.

6.4 Potential impacts on the living communities or human uses (Subparts D, E and F):

6.4.1 Potential impacts on the biological characteristics of the aquatic ecosystem (Subpart D 40 CFR 230.30). See Table 2:

Table 2 – Potential Impacts on Biological Characteristics

Biological characteristics	N/A	No Effect	Negligible Effect	Minor Effect (Short Term)	Minor Effect (Long Term)	Major Effect
Threatened and endangered species					X	
Fish, crustaceans, mollusk, and other aquatic organisms				X		
Other wildlife					X	

Discussion: As discussed during the Dock 1 project, ship strikes are the NMFS' primary concern with respect to sturgeon deaths in the Delaware River. The applicant has stated that 89 new vessels per year (seven (7) vessels per month) will be using the Delaware River as a result of the all construction activities at the site. The NMFS indicated in the Biological Opinion that this increase the number of vessels will not be significant.

6.4.2 Potential impacts on special aquatic sites (Subpart E 40 CFR 230.40). See Table 3:

Table 3 – Potential Impacts on Special Aquatic Sites

Special Aquatic Sites	N/A	No Effect	Negligible Effect	Minor Effect (Short Term)	Minor Effect (Long Term)	Major Effect
Sanctuaries and refuges	X					
Wetlands	X					
Mud flats	X					
Vegetated shallows			X			
Coral reefs	X					

Discussion: A small area of SAV (< 0.01 acre) will be impacted by shading from the trestle.

6.4.3 Potential impacts on human use characteristics (Subpart F 40 CFR 230.50). See Table 4:

Table 4 – Potential Impacts on Human Use Characteristics

Human Use Characteristics	N/A	No Effect	Negligible Effect	Minor Effect (Short Term)	Minor Effect (Long Term)	Major Effect
Municipal and private water supplies			X			
Recreational and commercial fisheries					X	
Water-related recreation					X	
Aesthetics					X	
Parks, national and historical monuments,		X				

Table 4 – Potential Impacts on Human Use Characteristics						
Human Use Characteristics	N/A	No Effect	Negligible Effect	Minor Effect (Short Term)	Minor Effect (Long Term)	Major Effect
national seashores, wilderness areas, research sites, and similar preserves						

Discussion: The closest municipal water intake is a groundwater well located 0.25 miles south and up gradient of the property boundary and about 1.5 miles from where the trestle makes landfall. The closest municipal intake on the river is located at river mile 111, approximately 24. 5 river miles from the site.

6.5 Pre-testing evaluation (Subpart G, 40 CFR 230.60):

The following has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. See Table 5:

Table 5 – Possible Contaminants in Dredged/Fill Material	
Physical characteristics	
Hydrography in relation to known or anticipated sources of contaminants	
Results from previous testing of the material or similar material in the vicinity of the project	
Known, significant sources of persistent pesticides from land runoff or percolation	
Spill records for petroleum products or designated (Section 331 of CWA) hazardous substances	
Other public records or significant introduction of contaminants from industries, municipalities, or other sources	
Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	

Discussion: The New Jersey Department of Environmental Protection (NJDEP) issued a permit, including the Water Quality Certification, and stated that the project was consistent with the states Coastal Zone Management Rules on May 20, 2019. The permit was suspended on June 5, 2019 due to a clerical error by the NJDEP. The permit was reinstated by the NJDEP on September 5, 2019.

It has been determined that testing is not required because the likelihood of contamination by contaminants is acceptably low and the material may be excluded from evaluation procedures. This determination is based on the sediment testing done by the applicant at the direction of the NJDEP. Additionally, on-shore contamination is being addressed by the previous owner and facility operations will not interfere with the continued contamination clean-up.

6.6 Evaluation and testing (Subpart G, 40 CFR 230-61):

Discussion: As stated above, testing of the sediment was a requirement of a WQC issued by the NJDEP. The sediment was deemed suitable for disposal at the either of the two (2) facilities proposed for the disposal of the dredged material.

6.7 Actions to minimize adverse impacts (Subpart H). The following actions, as appropriate, have been taken through application of 40 CFR 230.70-230.77 to ensure minimal adverse effects of the proposed discharge. See Table 6:

Table 6 – Actions to Ensure Adverse Effects are Minimized	
Actions concerning the location of the discharge	
Actions concerning the material to be discharged	
Actions controlling the material after discharge	
Actions affecting the method of dispersion	
Actions affecting plant and animal populations	
Actions affecting human use	

Discussion: An environmental bucket will be used and protocol will be established to minimize the amount of sediment generated during the excavation of the accumulated sediment, while maximizing the amount removed from the waterway. Additionally, measures will be taken to minimize impacts from the installation of the piles at the site such as soft starts and use of a bubble curtain.

6.8 Factual Determinations (Subpart B, 40 CFR 230.11). The following determinations are made based on the applicable information above, including actions to minimize effects and consideration for contaminants. See Table 7:

Table 7 – Factual Determinations of Potential Impacts						
Site	N/A	No Effect	Negligible Effect	Minor Effect (Short Term)	Minor Effect (Long Term)	Major Effect
Physical substrate					X	
Water circulation, fluctuation and salinity		X				
Suspended particulates/turbidity					X	
Contaminants		x				
Aquatic ecosystem and organisms				X		
Proposed disposal site				x		
Cumulative effects on the aquatic ecosystem				X		
Secondary effects on the aquatic ecosystem				X		

Discussion: Sediment testing showed minimal contamination that would be available to spread in the waterway. Adjacent upland sites are being remediated by the previous owner of the site. Aquatic organisms, including benthic organisms, will be impacted by the work at the site. Site conditions will stabilize once in-water work is completed. When ships are in port, existing habitat may be impacted by the vessels (space and disturbance due to prop wash), however, the benthic community beneath the ships will recover. The habitat will be affected by the ships in port, however when not in port, the habitat, though impacted by the ships, will be available for fish to use.

6.9 Findings of compliance or non-compliance with the restrictions on discharges (40 CFR 230.10(a-d) and 230.12). Based on the information above, including the factual determinations, the proposed discharge has been evaluated to determine whether any of the restrictions on discharge would occur. See Table 8:

Table 8 – Compliance with Restrictions on Discharge		
Subject	Yes	No
1. Is there a practicable alternative to the proposed discharge that would be less damaging to the environment (any alternative with less aquatic resource effects, or an alternative with more aquatic resource effects that avoids other significant adverse environmental consequences?)		X

Table 8 – Compliance with Restrictions on Discharge		
Subject	Yes	No
2. Will the discharge cause or contribute to violations of any applicable water quality standards?		X
3. Will the discharge violate any toxic effluent standards (under Section 307 of the Act)?		X
4. Will the discharge jeopardize the continued existence of endangered or threatened species or their critical habitat?		X
5. Will the discharge violate standards set by the Department of Commerce to protect marine sanctuaries?		X
6. Will the discharge cause or contribute to significant degradation of waters of the U.S.?		X
7. Have all appropriate and practicable steps (Subpart H, 40 CFR 230.70) been taken to minimize the potential adverse impacts of the discharge on the aquatic ecosystem?	X	

Discussion: WQC and CZM was issued for the project by the NJDEP. Sediment generation from the dredging and port operations should have minimal impacts to the river. Both potential disposal sites have be review and approved by this office to accept the material to be generated from the river.

7.0 General Public Interest Review (33 CFR 320.4 and RGL 84-09)

The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest as stated at 33 CFR 320.4(a). To the extent appropriate, the public interest review below also includes consideration of additional policies as described in 33 CFR 320.4(b) through (r). The benefits which reasonably may be expected to accrue from the proposal are balanced against its reasonably foreseeable detriments.

7.1 All public interest factors have been reviewed and those that are relevant to the proposal are considered and discussed in additional detail. See Table 9 and any discussion that follows.

Table 9: Public Interest Factors	Effects					
	None	Detrimental	Neutral (mitigated)	Negligible	Beneficial	Not Applicable
1. Conservation: Impacts for resources outside the control of the Corps are being addressed by the appropriate state/Federal resource agency			X			
2. Economics: It is expected that the project will improve economic conditions around the project site.					X	
3. Aesthetics: The additional structures and upland construction activities that would result from the project will have an impact on the aesthetics surrounding the site. Site has been extensively modified over the years for commercial uses.				X		
4. General Environmental Concerns: While impacts will result from the development and operation of the facility, overall impacts on the environment will be mitigated with the inclusion of special conditions.			X			
5. Wetlands: No Federally regulated wetlands will be impacted as a result of the project. Any wetland impacts are under the review of the NJDEP. Potential secondary impacts from wave action from the vessels using the dock should also be minimal due to reduced speed of vessels as they enter/leave port.			X			
6. Historic Properties: In a memo dated March 18, 2019, the District's CRS/TL stated that "The USACE has reviewed the report titled, Phase I Underwater Archaeological Investigations, Thompson Point, Repauno Site, Delaware River, Greenwich Township, Gloucester County, New Jersey prepared by Dolan Research, Inc. and dated February 2019. Analysis of fieldwork data confirms the presence of three magnetic targets and nine acoustic targets in the permit area; however, none of these targets are considered to be suggestive of potential submerged cultural resources and no further archaeological work is recommended."			X			

Table 9: Public Interest Factors	Effects					
	None	Detrimental	Neutral (mitigated)	Negligible	Beneficial	Not Applicable
7. Fish and Wildlife Values: Any work performed in the river will have an effect on aquatic resources. Measures will be taken during the construction phase to minimize impacts to these resources. With respect to the 2 sturgeon species, a BiOP was developed for the Dock 1 by NMFS, and modified with respect to the second structure. Additionally, project was coordinated with USFWS, no objections with respect to fish and wildlife values were received from the USFWS.				X		
8. Flood Hazards: The project will not have any impact on potential flooding around the site. The NJDEP has issued a Flood Hazard permit for the work at the site.			X			
9. Floodplain Values: Structures will be located in the floodplain, having a slight impact on this resource.				X		
10. Land Use: The site has been abandoned for many years. The site is part of a larger complex that was owned by DuPont. As stated above, a docking structure was previously located within the river. An existing intake structure in the waterway will be used as part of the fire suppression system.			X			
11. Navigation: The vessels using Dock 2 will be new to the river, the project will have minimal impacts on general navigation in the waterway. The USCG is developing a protocol on how the LNG ships will navigate within the waterway. The waterway is a major navigation route in the area, only licensed pilots are allowed to command the larger vessels that would use the project site.				X		
12. Shoreline Erosion and Accretion: Based on the design of the dock, the distance from shore and the existing bank stabilization at the site, overall impact to this resource is expected to be minimal.				X		

Table 9: Public Interest Factors	Effects					
	None	Detrimental	Neutral (mitigated)	Negligible	Beneficial	Not Applicable
13. Recreation: Recreational users of the waterway are used to seeing large commercial vessels navigating through the river. Based on the information supplied by the applicant, only 7 vessels/month not currently using the waterway will use Docks 1 and 2. This should have minimal impacts to recreation boats in the area.			X			
14. Water Supply and Conservation: During dredging at the site, background sediment levels in the waterway will increase, which may have a temporary effect on water intake systems along the waterway.				X		
15. Water Quality: No lasting water quality impacts are expect by the project. The NJDEP issued a WQC for the project on September 5, 2019.				X		
16. Energy Needs: There will still be a need for petroleum products through the lifespan of this project (30 years). While renewable energy alternatives will increase in scale and prevalence, there will still be a need for fossil fuels. This site will help deliver the fuels to places around the county and the world.					X	
17. Safety: The applicant has stated that all state and Federal regulations as required by law will be followed at the project site.			X			
18. Food and Fiber Production: The project will have a minor effect on this public interest factor. The increase in vessels traffic will have a minor impact on fishing interests within Delaware Bay.				X		
19. Mineral Needs: Natural gas products may be considered a mineral resource and would be relevant to this application. As stated above, petroleum products are going to be needed for the life expectancy of the project.					X	
20. Consideration of Property Ownership: The applicant is the owner of the subject property.	X					

Table 9: Public Interest Factors	Effects					
	None	Detrimental	Neutral (mitigated)	Negligible	Beneficial	Not Applicable
21. Needs and Welfare of the People: As previously stated, petroleum products will be required the world for years to come. As with all industrial sites, there the potential for accidents that can affect the surrounding community. The applicant has stated that all safety measures as required by law will be followed at the project site.			X			

Additional discussion of effects on factors above: N/A

7.1.1 Climate Change. The proposed activities within the Corps federal control and responsibility likely will result in a negligible release of greenhouse gases into the atmosphere when compared to global greenhouse gas emissions. Greenhouse gas emissions have been shown to contribute to climate change. Aquatic resources can be sources and/or sinks of greenhouse gases. For instance, some aquatic resources sequester carbon dioxide whereas others release methane; therefore, authorized impacts to aquatic resources can result in either an increase or decrease in atmospheric greenhouse gas. These impacts are considered de minimis Greenhouse gas emissions associated with the Corps federal action may also occur from the combustion of fossil fuels associated with the operation of construction equipment, increases in traffic, etc. The Corps has no authority to regulate emissions that result from the combustion of fossil fuels. These are subject to federal regulations under the Clean Air Act and/or the Corporate Average Fuel Economy (CAFE) Program. Greenhouse gas emissions from the Corps action have been weighed against national goals of energy independence, national security, and economic development and determined not contrary to the public interest.

7.2 The relative extent of the public and private need for the proposed structure or work:

The need for petroleum products is undeniable for the life span of the project. The movement of the product around the world is undeniable. While renewable energy resources are going to be more widely available as the cost per kilowatt hour decreases, there will likely be a reduced need for petroleum products. However, it is the opinion of this office, based upon information submitted by the applicant that through the 30 year lifespan of this project, the need for petroleum products will not be eliminated.

7.3 If there are unresolved conflicts as to resource use, explain how the practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed structure or work was considered.

Discussion: There were no unresolved conflicts identified as to resource use.

7.4 The extent and permanence of the beneficial and/or detrimental effects that the proposed work is likely to have on the public and private use to which the area is suited:

Detrimental effects are expected to be minimal and temporary.

Beneficial effects are expected to be minimal and temporary.

Immediate impacts will result from the dredging and installation of the piles/decking/pipeline in and over the waterway. Construction equipment will have a temporary impact on water resources on the project site. Dredging will have temporary impacts as noted above. Benefits will be new job opportunities in the region as a result of the project. Once operations on the site are engaged, impacts from ships in the waterway and trucks on the roads are unavoidable. Ships navigating the waterway can have an impact on fish in the waterway. Heightened security around the site and the vessels as they navigate the river will impact local residents and vessels using the Delaware River. Increased vessel traffic will impact other vessels on the waterway Impacts both beneficial and detrimental will last for the life of the project. Beneficial impacts include the creation of jobs in an economically depressed area, and fuel resources will be sent to regions that need this natural resource.

8.0 Mitigation(33 CFR 320.4(r), 33 CFR Part 332, 40 CFR 230.70-77, 40 CFR 1508.20 and 40 CFR 1502.14)

8.1 Avoidance and Minimization: When evaluating a proposal including regulated activities in waters of the United States, consideration must be given to avoiding and minimizing effects to those waters. Avoidance and minimization measures are described above in Sections 1 and 3.

Were any other mitigative actions including project modifications discussed with the applicant implemented to minimize adverse project impacts? (see 33 CFR 320.4(r)(1)(i)) No

8.2 Is compensatory mitigation required to offset environmental losses resulting from proposed unavoidable impacts to waters of the United States? No

Provide rationale: Less than 0.1 acre of SAV habitat will be impacted by the construction of the trestle and the shading caused by this structure.

9.0 Consideration of Cumulative Impacts

(40 CFR 230.11(g) and 40 CFR 1508.7, RGL 84-9) Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor direct and indirect but collectively significant actions taking place over a period of time. A cumulative effects assessment should consider how the direct and indirect environmental effects caused by the proposed activity requiring DA authorization (i.e., the incremental impact of the action) contribute to cumulative effects, and whether that incremental contribution is significant or not. .

9.1 Identify/describe the direct and indirect effects caused by the proposed activity:

The direct effect would be:

- Dredging within the 45 acres of the Delaware River;
- The placement of the dredged material into scow for transport to the disposal site;
- If Whites Basin is used, the release of the material into the re-handling basin;
- The construction and installation of the structure in the river;
- Shading of SAV habitat in the waterway;
- Vessels that would use the structure for loading of bulk liquid products navigating in the river.

The indirect impacts would be:

- Increased truck traffic in and around the project site;
- Slight increase in boat traffic in the waterway;
- Extra security required for vessels handling LNG, including when vessels leave port and pass within certain sections of the waterway as determined by the USCG;
- Potential general impacts to the environment from an industrial property.

9.2 The geographic scope for the cumulative effects assessment is:

The scope of the project this office directly regulates is the portion of the river where the dredging will occur and the location of the structure. Also, the locations on the uplands where the tankers would be placed to be off-loaded and the pipelines leading from the tankers to the vessels. Impacts off-site resulting from the use of the by-pass road are also included in the Corps scope. Additionally, the portions of the Federal navigation channels where vessels will enter and exit near the project site.

9.3 The temporal scope of this assessment covers: The life expectancy for the project, which is 30 years.

9.4 Describe the affected environment: Open water habitat will be impacted by the dredging and installation of the structure within the waterway. Water depth where the dredging will take place ranges from 20-40 feet. Substrate is silt and clay, with some sand. The upland locations where the takers and pipelines will be located will be affected by the project.

9.5 Determine the environmental consequences: In the short term during construction, impacts to the waterway are unavoidable. Sediment transfer from the dredging and acoustic impacts from the driving of piles will impact the waterway. Transporting the excavated material from the site to the disposal area could impact the waterway. There are always a chance of unknown impacts from the proposed work. However, with the proper execution of safety protocol by all parties, overall impacts to the environment will be minimal.

9.6 Discuss any mitigation to avoid, minimize or compensate for cumulative effects: The placement of the trestle was selected to minimize impacts to SAV in the area of the construction. When originally designed, no SAV was under the proposed trestle. A survey in 2019 has determine some SAV has migrated to the area where the trestle will be located. Plants have been moved from the trestle area to the mitigation area for Dock 1. All procedures/equipment as required by law will be employed at the site to minimize potential impacts resulting from operations at the site.

9.7 Conclusions regarding cumulative impacts:

When considering the overall impacts that will result from the proposed activity, in relation to the overall impacts from past, present, and reasonably foreseeable future activities, the incremental contribution of the proposed activity to cumulative impacts in the area described in section 9.2, are not considered to be significant . Compensatory mitigation will not be required to help offset the impacts to eliminate or minimize the proposed activity's incremental contribution to cumulative effects within the geographic area described in Section 9.2. Mitigation required for the proposed activity is discussed in Section 8.0.

10.0 Compliance with Other Laws, Policies, and Requirements

10.1 **Section 7(a)(2) of the Endangered Species Act (ESA):** Refer to Section 2.2 for description of the Corps action area for Section 7.

10.1.1 Has another federal agency been identified as the lead agency for complying with Section 7 of the ESA with the Corps designated as a cooperating agency and has that consultation been completed? No

10.1.2 Are there listed species or designated critical habitat present or in the vicinity of the Corps' action area? Yes

Effect determination(s), including no effect, for all known species/habitat, and basis for determination(s): In consultation with the NMFS, Protective Resource Division, it is the determination that with the inclusion of special conditions with respect to seasonal restrictions, installation of the piles, and how the excavated material is removed, the project will affect, but is not likely adversely affect the two (2) sturgeon species at the site. The project will also have minimal effect on the critical habitat for Atlantic Sturgeon. The project should have minimal impacts on both terrestrial and aquatic species in and around the site.

10.1.3 Consultation with either the National Marine Fisheries Service and/or the U.S. Fish and Wildlife Service was initiated and completed as required, for any determinations other than "no effect" (see the attached ORM2 Summary sheet for begin date, end date and closure method of the consultation). Based on a review of the above information, the Corps has determined that it has fulfilled its responsibilities under Section 7(a)(2) of the ESA. The documentation of the consultation is incorporated by reference.

10.2 **Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), Essential Fish Habitat (EFH).** N/A, there is no essential fish habitat in this district's area of responsibility. However, species of concern use the area of the project site and this office coordinated with the NMFS Habitat Conservation Division.

10.2.1 Has another federal agency been identified as the lead agency for complying with the EFH provisions of the Magnuson-Stevens Act with the Corps designated as a cooperating agency and has that consultation been completed? No

10.2.2 Did the proposed project require review under the Magnuson-Stevens Act? No, but this office coordinated with NMFS with respect to prey species covered under the Act that would inhabit the project site. A seasonal restriction will be added to the permit to minimize the impacts to prey species of EFH.

10.2.4 Consultation with the National Marine Fisheries Service was initiated and completed as required (see the attached ORM2 Summary sheet for consultation type, begin date, end date and closure method of the consultation). Based on a review of the above information, the Corps has determined that it has fulfilled its responsibilities under EFH provisions of the Magnuson-Stevens Act.

10.3 **Section 106 of the National Historic Preservation Act (Section 106):** Refer to Section 2.3 for permit area determination.

10.3.1 Has another federal agency been identified as the lead federal agency for complying with Section 106 of the National Historic Preservation Act with the Corps designated as a cooperating agency and has that consultation been completed? No

10.3.2 Known historic properties present? Yes The Corps has reviewed the documentation provided by the agency and determined it is sufficient to confirm Section 106 compliance for this permit authorization, and additional consultation is not necessary.

Effect determination and basis for that determination: In a memo dated March 18, 2019, the District's Cultural Resource Specialist stated "The USACE has reviewed the report titled, "Phase I Underwater Archaeological Investigations, Thompson Point, Repauno Site, Delaware River, Greenwich Township, Gloucester County, New Jersey" prepared by Dolan Research, Inc. and dated February 2019. Analysis of fieldwork data confirms the presence of three magnetic targets and nine acoustic targets in the permit area; however, none of these targets are considered to be suggestive of potential submerged cultural resources and no further archaeological work is recommended".

10.3.3 Consultation was initiated and completed with the appropriate agencies, tribes and/or other parties for any determinations other than "no potential to cause effects" (see the attached ORM2 Summary sheet for consultation type, begin date, end date and closure method of the consultation). Based on a review of the information above, the Corps has determined that it has fulfilled its responsibilities under Section 106 of the NHPA. Compliance documentation incorporated by reference.

10.4 **Tribal Trust Responsibilities**

10.4.1 Was government-to-government consultation conducted with Federally-recognized Tribe(s)?No

10.4.2 Other Tribal including any discussion of Tribal Treaty rights? N/A

10.5 **Section 401 of the Clean Water Act – Water Quality Certification (WQC)**

10.5.1 Is a Section 401 WQC required, and if so, has the certification been issued, waived or presumed? An individual water quality certification is required and has been issued by the certifying agency.

10.6 **Coastal Zone Management Act (CZMA)**

10.6.1 Is a CZMA consistency concurrence required, and if so, has the concurrence been issued, waived or presumed?

An individual CZMA consistency concurrence is required and has been issued by the appropriate agency

10.7 **Wild and Scenic Rivers Act**

10.7.1 Is the project located in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system? No

10.8 **Effects on Corps Civil Works Projects (33 USC 408)**

10.8.1 Does the applicant also require permission under Section 14 of the Rivers and Harbors Act (33 USC 408) because the activity, in whole or in part, would alter, occupy or use a Corps Civil Works project? No, the appropriate non-Regulatory office has determined that there will be no effects to federal projects that require permission from the Corps.

10.9 **Corps Wetland Policy (33 CFR 320.4(b))**

10.9.1 Does the project propose to impact wetlands? No

10.9.2 Based on the public interest review herein, the beneficial effects of the project outweigh the detrimental impacts of the project.

10.10 **Other (as needed):** N/A

11.0 Special Conditions

11.1 Are special conditions required to protect the public interest, ensure effects are not significant and/or ensure compliance of the activity with any of the laws above? Yes

11.2 Required special condition(s)

Special condition(s):

1. All work performed in association with the above noted project shall be conducted in accordance with the project plans entitled “DRP Gibbstown Logistics Center Dock 2”, prepared by Moffatt and Nichol, 11, 11A, 12, 12A, 15 through 20 dated February 22, 2019, last revised August 16, 2019, sheet 13 dated February 22, 2019 last revised December 2, 2019, sheet 14 dated February 22, 2019, last revised December 2, 2019. The project plans provide for the dredging of approximately 45 acres of the waterway to a depth of minus 43 feet mean lower low water ± 1 foot. Docking facilities will be constructed at the site as indicated above.

2. Construction activities shall not result in the disturbance or alteration of greater than 47 acre of waters of the United States.

3. Any deviation in construction methodology or project design for activities in waters of the United States from that shown on the above noted drawings must be approved by this office, in writing, prior to performance of the work. All modifications to the above noted project plans shall be approved, in writing, by this office. No work shall be performed prior to written approval of this office.

4. This office shall be notified at least 10 days prior to the commencement of authorized work by completing and signing the attached Notification/ Certification of Work Commencement Form. This office shall also be notified within 10 days of the completion of the authorized work by completing and signing the attached Notification/Certification of Work Completion/Compliance Form. All notifications required by this condition shall be in writing and shall be transmitted to this office by registered mail. Oral notifications are not acceptable. Similar notification is required each time maintenance work is to be done under the terms of this Corps of Engineers permit.

5. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

6. A minimum of 30 days prior to commencing work, the permittee/contractor shall request in writing, from the U.S. Coast Guard, that a Local Notice to Mariners be issued regarding the authorized construction work. This written request shall include the location of work, a description of the construction activities; type of construction equipment to be used and expected duration of work in the waterway. The written request should be addressed to the following:

Mr. Ward B. Posey Local Notice to Mariners Fifth Coast Guard District 431 Crawford Street Portsmouth, Virginia 23704-5004 (757) 398-6229 Ward.B.Posey@uscg.mil
A copy of the cover letter shall be forward to our office for our records.

7. In order to avoid impacts to anadromous fisheries resources, no in-water work shall occur between March 15th and June 30th of any given year. If future work is requested during the seasonal restriction, this office will re-coordinate with the National Marine Fisheries Service (NMFS) and no in-water work will be allowed until coordination with the NMFS is complete.

8. In order to avoid impacts to Atlantic Sturgeon (Acipenser oxyrhynchus oxyrhynchus), no in-water work shall occur between March 15th and September 15th of any year to ensure impacts to the larval phase of will be minimal. If future work is requested during the seasonal restriction, this office will re-coordinate with the National Marine Fisheries Service (NMFS) and no in-water work will be allowed until coordination with the NMFS is complete. If the carcass of an Atlantic or Shortnose sturgeon is noted within the waters surrounding the port facility, the sighting must be reported to NMFS within 24 hours at incidental.take@noaa.gov

9. To minimize impacts to the fisheries resources, a “soft start”, which involves having the hammer (both vibratory and impact) commencing work at half power, shall be employed, for a minimum of 15 minutes. After this time period, the hammer can be used at full power.

10. At least 30 days prior to the commencement of work within areas of Federal jurisdiction, a pre-construction meeting must be held with the permittee, their contractors, and representatives of this office to insure that all permit conditions are fully understood by the permittee and their contractors.

11. An environmental bucket shall be used for the removal of accumulated sediment at the site. The permittee shall monitor the descent of the bucket, and ensure that it is used in such a manner that the bucket will not penetrate beyond the vertical dimension of the bucket. The permittee shall minimize the loss of sediment due to extrusion through the bucket vent openings and hinge area.

12. In order to minimize sedimentation of the waterway during removal of accumulated sediment, the environmental bucket shall be operated in a manner that will minimize the number of passes required to remove the sediment and shall not be dragged over the substrate. Additionally, the rate of removal of the bucket from the river shall be performed at a rate no greater than 2 feet per second.

13. Any hydraulically dredged material pumped via pipeline to the Whites Basin CDF shall be placed within a basin located on the upland portions of the facility. The material shall not be discharged directly into the re-handling basin.

14. The pipeline conveying the dredged material shall be located no closer than 100 feet from the edge of the Federal navigation channel as shown on local navigation charts.

15. In the event that the permittee selects to dispose of any dredged materials at the Fort Mifflin dredged material disposal facilities, they shall contact Mr. Timothy Rooney of the Philadelphia District Operations Division by calling (215-656-6592) or by e-mail at (timothy.j.rooney@usace.army.mil) a minimum of 30 days prior to the proposed commencement of dredging activities to verify availability of the Fort Mifflin Confined Disposal Site (CDF) for the dredged materials and to finalize any other details relating to the placement/handling of the dredged materials.

16. In the event that the permittee selects to dispose of any dredged materials at the Fort Mifflin CDF, the permittee shall obtain a Water Quality Certificate (WQC) from the Pennsylvania Department of Environmental Protection (PADEP) prior to any disposal activities. It is the permittee's responsibility to ensure that all material to be placed at the Fort Mifflin CDF site shall meet all requirements, including a site specific Water Quality Certification, from the PADEP.

17. Any disposal of dredged materials at the Fort Mifflin CDF shall be conducted in accordance with the stipulations in Department of the Army Real Estate License Number DACW-31-3-17-316 between the US Army Corps of Engineers, Baltimore District, Real Estate Division and CLEAN EARTH DREDGING TECHNOLOGIES, LLC, 334 S. Warminster Road, Hatboro, Pennsylvania 19040, (Granted March 10, 2017). Particular attention is directed to the stipulation (Section 2 a.) requiring that the permittee remove 1.5 times the volume of any material to be placed within the CDF, by measure, prior to the disposal of any dredged materials into the CDF. Bathymetric surveys must be performed both prior to and after dredging to confirm the amount of material placed at the Fort Mifflin CDF. All survey work shall be performed at the permittee’s expense.

18. The decision to issue this permit was partially based upon the proposal for truck traffic accessing the port via the Gloucester County Route 44 by-pass in order to minimize traffic impacts to the community. As such, trucks containing Liquefied Natural Gas or other liquid petroleum products shall not access the site other than from the by-pass. Should the development of the by-pass be delayed or abandoned, you shall contact this office and no work shall begin until this office has re-evaluated traffic impacts to the community.

19. No pile driving can be performed until this office receives and approves the design for a bubble curtain that will be used to minimize sound generated by the work in the waterway.

Rationale: Permit special conditions 1-5 have been added to the permit, and are blanket conditions established by the Regulatory Branch to insure that the project is constructed as authorized, and to insure that project impacts are minimal. Conditions 6 was included to minimize impact to navigation in the waterway, both during work at the site and for future navigation in the River. Special conditions 7 through 9 was added to minimize impact to fisheries resources in the area. Special condition 10 was added to ensure the contractor/permittee were clear on the permit conditions that were made a requirement of the permit. Special conditions 11-14 were added to minimize impacts from work at the site. Special conditions 15 through 17 were added address handling of the excavated material at the project site and the disposal of the material. Special Condition 18 was included to minimize potential hazards to local residents from an LNG accident. Special Condition 19 is included to minimize impacts of sound waves that will be generated by the installation of the piles at the site.

12.0 Findings and Determinations

12.1 Section 176(c) of the Clean Air Act General Conformity Rule Review: The proposed permit action has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined that the activities proposed under this permit will not exceed deminimis levels of direct or indirect emissions of a criteria pollutant or its precursors and are exempted by 40 CFR Part 93.153. Any later indirect emissions are generally not within the Corps' continuing program responsibility and generally cannot be practicably controlled by the Corps. For these reasons a conformity determination is not required for this permit action.

12.2 Presidential Executive Orders (EO):

12.2.1 EO 13175, Consultation with Indian Tribes, Alaska Natives, and Native Hawaiians: This action has no substantial effect on one or more Indian tribes, Alaska or Hawaiian natives.

12.2.2 EO 11988, Floodplain Management: Alternatives to location within the floodplain, minimization and compensatory mitigation of the effects were considered above.

12.2.3 EO 12898, Environmental Justice: The Corps has determined that the proposed project would not use methods or practices that discriminate on the basis of race, color or national origin nor would it have a disproportionate effect on minority or low-income communities.

12.2.4 EO 13112, Invasive Species: There are no invasive species issues involved in this proposed project.

12.2.5 EO 13212 and EO 13302, Energy Supply and Availability: The review was expedited and/or other actions were taken to the extent permitted by law and regulation to accelerate completion of this energy related project while maintaining safety, public health and environmental protections.

12.3 Findings of No Significant Impact: Having reviewed the information provided by the applicant and all interested parties and an assessment of the environmental impacts, I find that this permit action will not have a significant impact on the quality of the human environment. Therefore, an environmental impact statement will not be required.

12.4 Compliance with the Section 404(b)(1) Guidelines: Having completed the evaluation above, I have determined that the proposed discharge complies with the Guidelines, with the inclusion of the appropriate and practicable special conditions to minimize pollution or adverse effects to the affected ecosystem.

12.5 Public interest determination: Having reviewed and considered the information above, I find that the proposed project is not contrary to the public interest.

PREPARED BY:

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Date: 2020.02.24 12:50:36 -05'00'

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Lawrence Slavitter

REVIEWED BY:

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______________________ Date:______________________
Michael Hayduk

APPROVED BY:

______________________ Date:______________________
Edward Bonner